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VOLUME XIV.
NUMBER 4.

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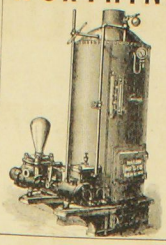

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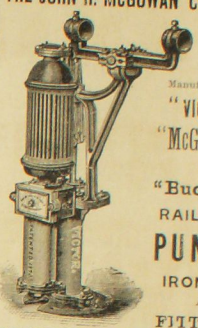

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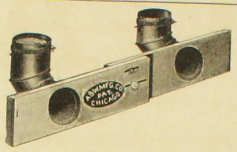

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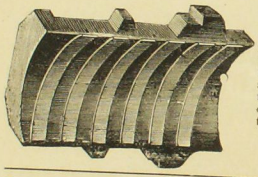

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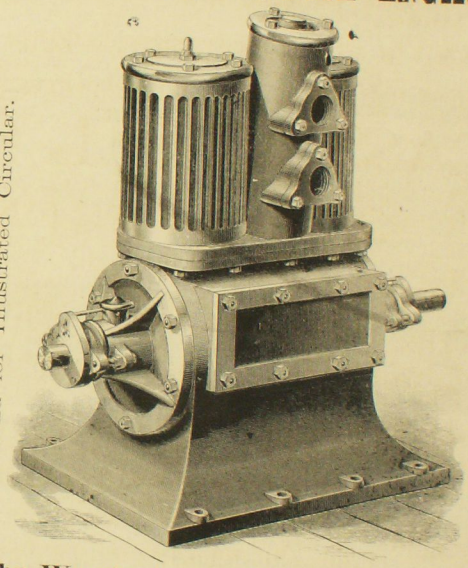

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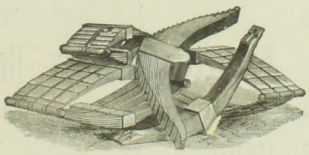
EXTRA TEMPERED,  LIGHT ELLIPTIC

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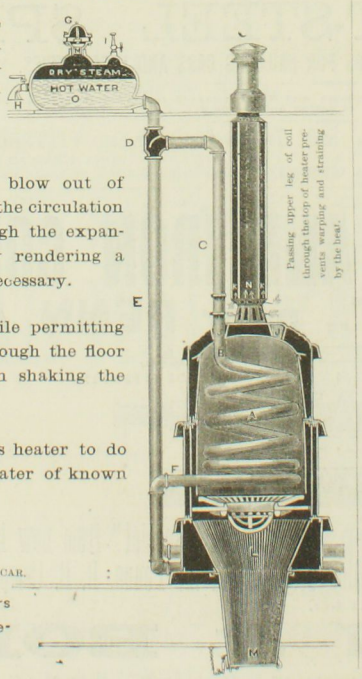

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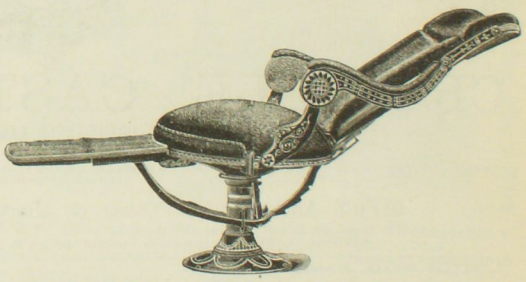

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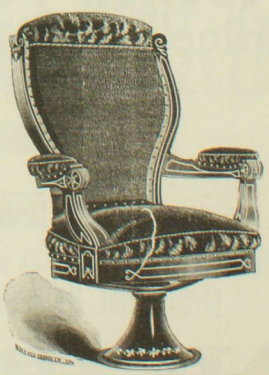

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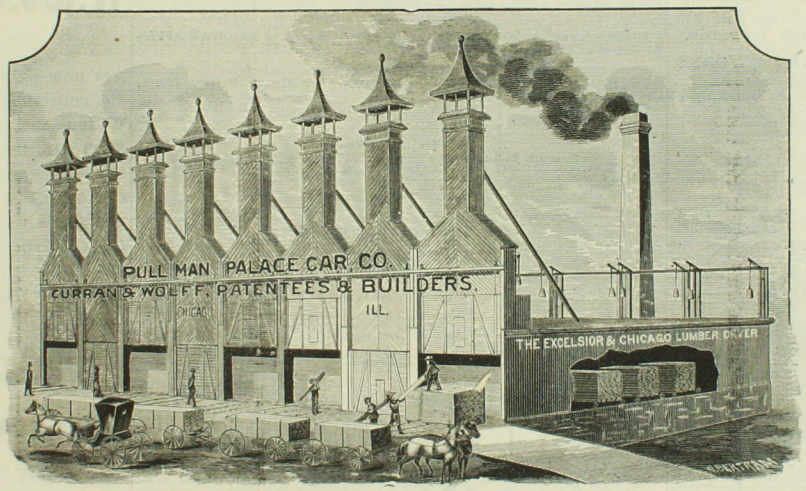

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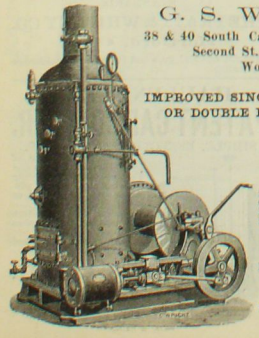

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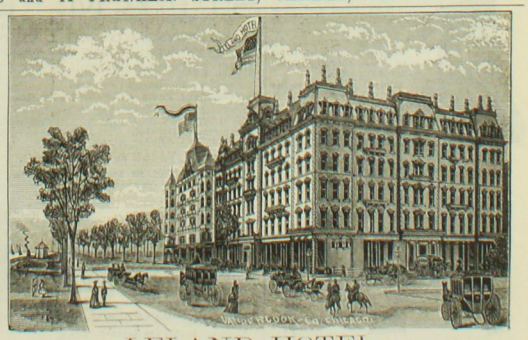

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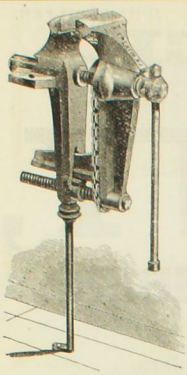

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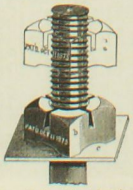

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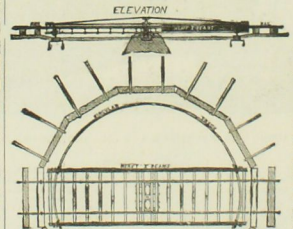

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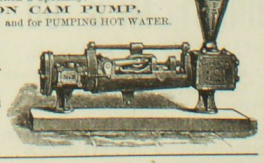

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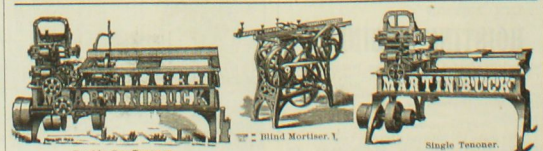

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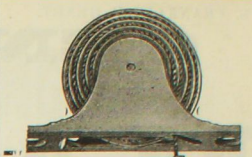

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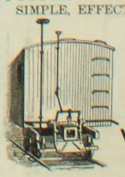

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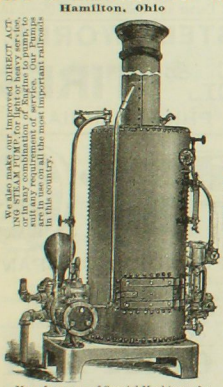

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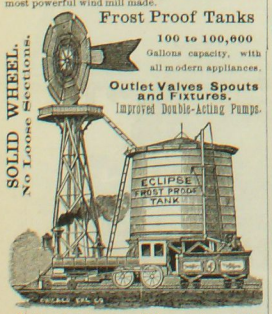

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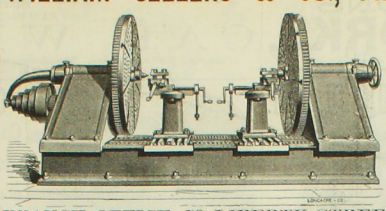

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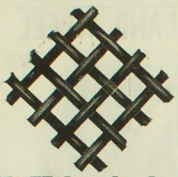

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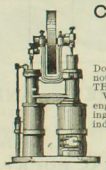

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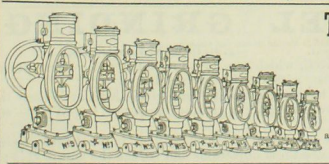

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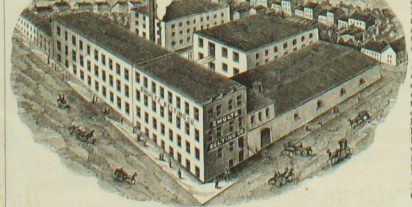

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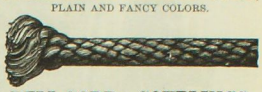

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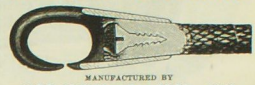

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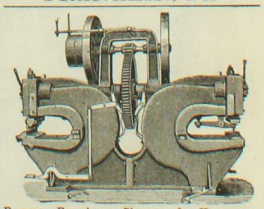

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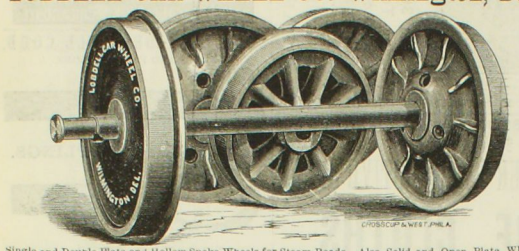

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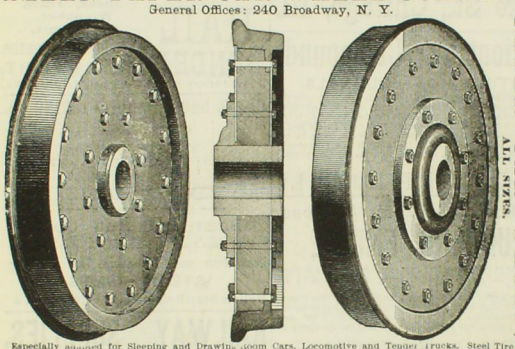

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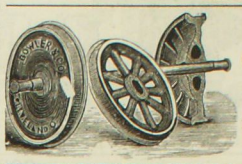

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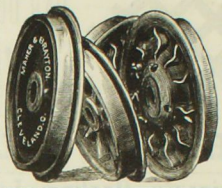

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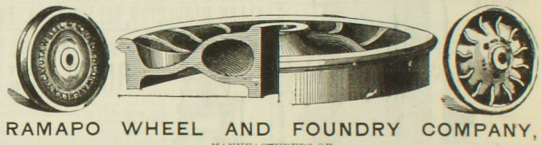

RAMAPO WHEEL AND FOUNDRY COMPANY,

MANUFACTURERS OF

Chilled Wheels for Drawing-Room and Sleeping Coaches, Locomotives, Tenders, Passenger and Freight Cars.

GEO. CHURCH, President and Treasurer. W. W. SNOW, Superintendent and General Manager

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CHILLED CAR WHEEL GRINDING COMPANY.

Patented in United States and Canada.

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The GOWAN CHILLED CAR WHEEL GRINDING MACHINE, which we now introduce, is no hasty device. It is the result of four and one-half years' experience, and during that time has received a most thorough test, with satisfactory results.

Railroad officials, upon reflection, will admit it is more essential to have a machine to true up Chilled Car Wheels than a Tire Lathe for turning locomotive tires, for this reason: four or more driving wheel tires are required for one engine; a greater number of Car Wheels compose a train; hence the necessity of this invention.

The great hardness of the chilled tread has hitherto rendered the operation of turning them impracticable, owing to the great expense, which made it cheaper to frequently replace the worn wheels with new ones. To obviate these objections and reduce the cost of this process, we furnish a machine capable of making a perfect wheel at small expense.

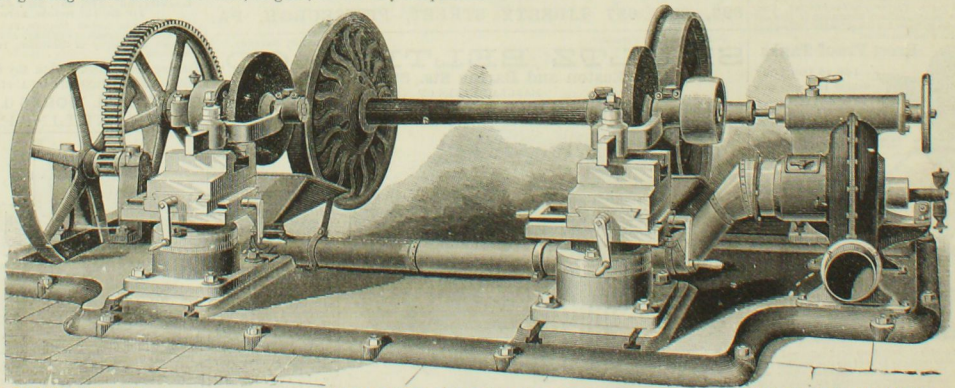
Wheels with flat places, and otherwise badly worn, that are ordinarily condemned and used for scrap iron, can be ground and fitted so as to double their original mileage. This alone makes our machine the greatest money saver ever introduced to railroads.

A sound Chilled Car Wheel trued by our method cannot be excelled by a paper or any other description of Car Wheel with steel tire.

Any person having a slight acquaintance with tools may, after five hours' instruction, become thoroughly competent to operate our machine.

Allowing all new wheels to be 3-32 inch oval, if properly fitted to axles, our machine *will* true up one pair an hour.

We manufacture expressly for use with our machine, Abrading Wheels, which, as the result of a series of experiments and long experience, we guarantee to be the best grinding wheels made. No odor, no glaze, and we defy competition.



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CANADIAN PACIFIC RAILROAD (VALE B. C.),

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We are prepared to sell machines outright, or to furnish them on royalty for each pair of wheels trued. Address

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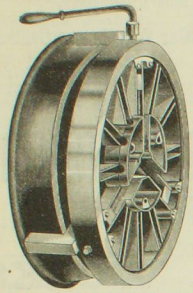

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This cut represents the Horton Car Wheel Chuck holding a car wheel in proper position for boring, the flange and tread of the wheel assuming a true position on the jaws.

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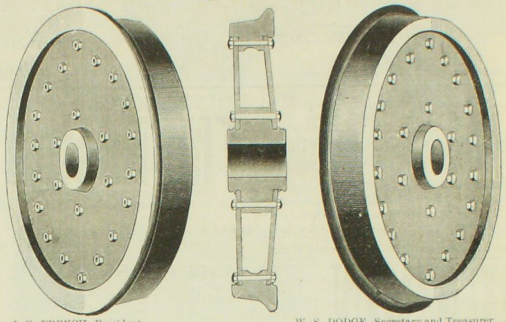

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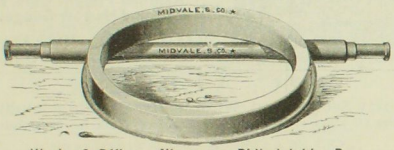

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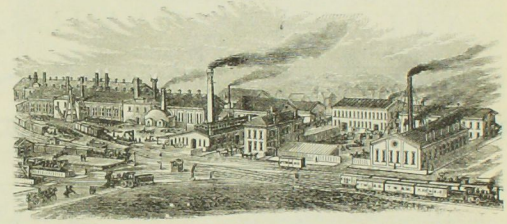

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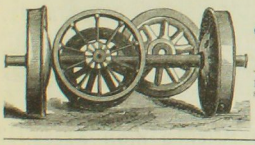

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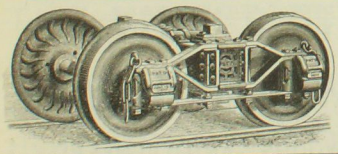

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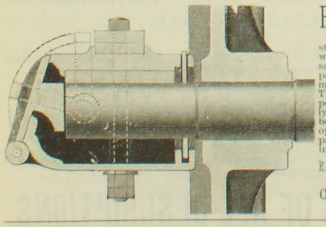

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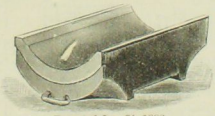

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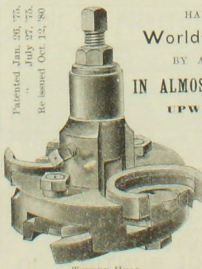

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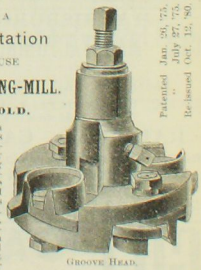

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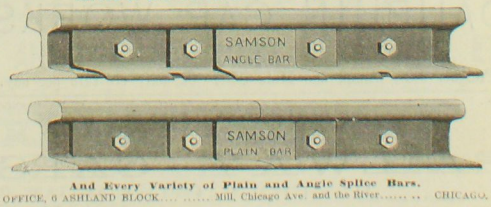

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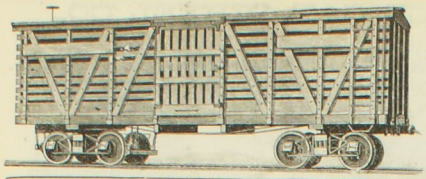

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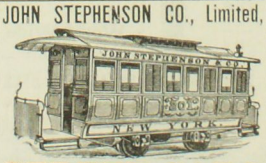

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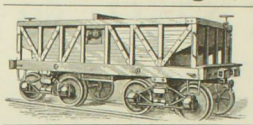

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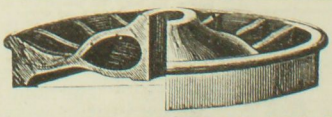

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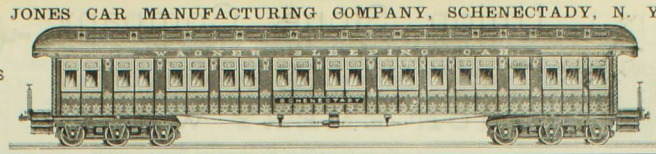

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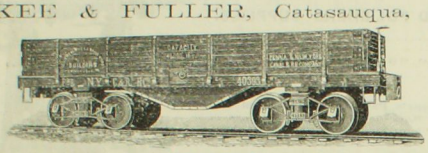

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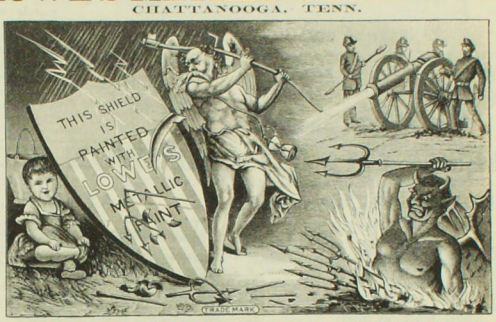

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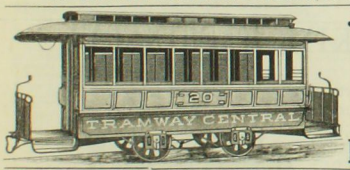

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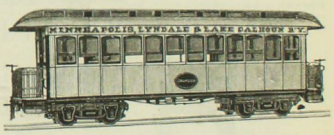
RAILWAY AND TRAMWAY CARS.



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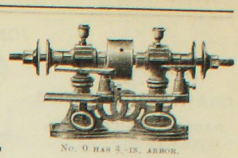

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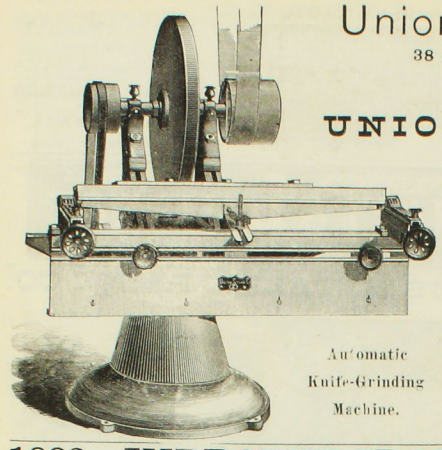

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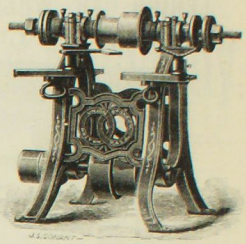

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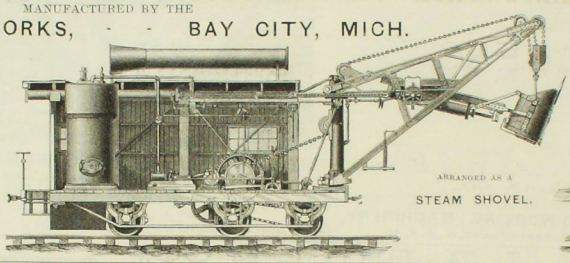

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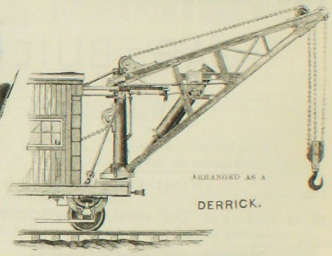

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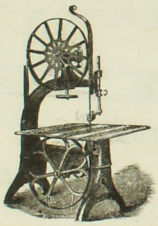

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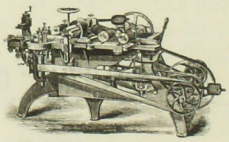

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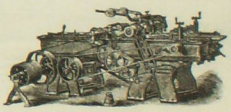

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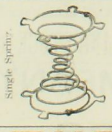
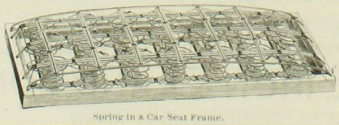
BUSHNELL'S PATENT SPRINGS for Car Seats Backs, Berths and Mattresses. Best in the world. Adopted and used by nearly all of the leading Railroad and Car Builders in the United States and Canada.



Single Spring.



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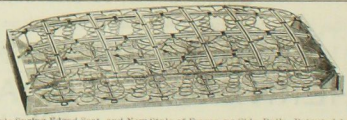

*Double Spring Edged Seat, and New Style of Frame, no Side Rails. Patented June, 1882.

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THE COWELL PLATFORM

Is the only device making A CONTINUOUS FLOOR between cars in motion.

IT ABOLISHES JERKING AND JOLTING, AND RUNS CARS STEADIER THAN ANYTHING AND EVERYTHING ELSE KNOWN.

We refer to the Flint & Pere Marquette R. R., which recently fully adopted our device, and to the following:

New York & Greenwood Lake Railway, Superintendent's Office, Jersey City, May 22, 1882.

Robert Harris, Esq., *Vice Pres't N. Y., L. E. & W. Ry.:*

In accordance with instructions contained in your letter of April 4th, I delivered one combination car and two coaches to the Cowell Platform Company, which they promptly equipped with their patent buffer, since which time the cars have been in constant service.

On Friday, May 19th, the buffers were subjected to a severe test in the presence of several prominent railway officials, and performed all and more than the Cowell Company claimed for them. Matches and toothpicks were placed between the buffers, in order to see if in starting or stopping the buffers would separate enough to let an article so small pass between them. In all these tests the tension kept up to its work and made the platforms continuous. There was no perceptible jerk when starting, and several times a high rate of speed was reached when the engine was reversed, the air applied and a danger stop made without any jar or unpleasant sensation felt other than in making an ordinary station stop. I feel justified in saying, I believe the Cowell Buffer to be a great improvement over any other device I have seen, and should be pleased to have the coaches of the Greenwood Lake Railway Company equipped with this device; believing the saving in the end would justify the expense. J. H. Tinney, *Acting Supt.*

L. S. & M. S. Ry. Superintendent's Office, Eastern Division, Chas. B. Couch, Sup't, Cleveland, O., April 7, 1882.

J. F. Herrick, Esq., *Sec'y and Treas. Cowell Platform and Coupling Co., Cleveland, O.:*

Dear Sir:—Having witnessed the exhibition of the "Cowell Platform and Buffer," at Cincinnati, March 22d, 1882, will say that in my opinion it is an excellent device. It is a safe and convenient Buffer, keeping the train very steady while in motion, especially over track of uneven surface and curves, there being no "lost motion" between the cars, which prevents the jolting and jarring occasioned by starting and stopping trains, as with the ordinary platform, thus saving much annoyance to passengers.

Yours truly, CHAS. B. COUCH.

S. L. Bell, Conductor on the Western & Atlantic R. R. says: "For two years I have been running a train of cars with your appliance, and I consider it the most practical and the most perfect device in use. It runs a train of cars steadier. I think, if properly managed, it will be a great saving to railroads, and I know affords much more comfort to the traveling public."

For further particulars address H. W. STAGER, Gen. Manager.

G. R. Carr, General Superintendent Columbus, Hocking Valley & Toledo R. R., says: "We prefer it to any in use that I have seen."

R. A. Cowell, Esq.: Meadville, Pa., June 7, 1881.

Dear Sir:—In reply to your inquiry as to my opinion of your platform, I think it the best in use, and I have seen nearly all of the improvements on railroads, as I have been in the transportation department for twenty-two years. I have been running a train on the N. Y., P. & O. R.R., equipped with your platform for the past nine months, and I can see no wear as yet. I think it will last as long as the car itself. They certainly can be run at a higher rate of speed with greater safety than any other in use. It prevents that rolling motion at the ends of the coaches; it also prevents the jerking of the train in stopping and starting, which is so unpleasant. In fact, I cannot say too much in its favor. There are a great many good things about it that I have not time or space to mention.

Very truly yours, J. W. BABCOCK, *Conductor N. Y., P. & O. R. R.*

J. W. Thomas, General Superintendent Nashville, Chattanooga & St. Louis Railway, says:

"A train of two coaches and a baggage car, equipped with your Continuous Platform and Coupler, has now been in service on our road for over a year, running in our accommodation train 110 miles per day, and has given entire satisfaction, costing nothing for repairs during that time."

J. G. Sawyer, Master Car-Builder of the same road, says:

"I have been using your Continuous Platform and Drawhead in three of our cars on the N. C. & St. Louis road for the past ten months. They work in every way to our satisfaction. In that time they have cost the company neither trouble nor expense. I believe them to be a first-rate Platform and Drawhead."

B. V. Holt, *Conductor.* J. G. Sawyer, *M. C. B.*

R. F. Smith, General Manager Cleveland & Pittsburgh R. R., says: "Your devices have given us entire satisfaction, having proved thoroughly efficient in accomplishing all the objects intended, and with marked economy as to maintenance."

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Gen. P. Pease, of Ohio Central Ry, after seeing the device on the Cincinnati Southern Ry, says: "I was much pleased with the 'Cowell Platform.' For safety and ease in turning abrupt curves, superior to any I have seen."

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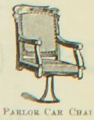

PARLOR CAR CHAI

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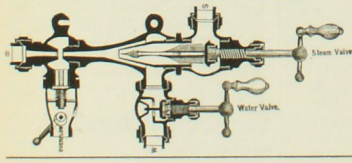

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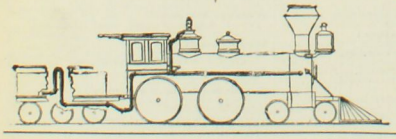

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The Ashton Blow-back Safety-valve is constructed so as to conduct the escape steam which is blown off back to the tender, or to the smoke-box and up the chimney. By this arrangement the heat of the escape steam, instead of being wasted as it is when an ordinary safety-valve blows off, is communicated to the cold water in the tender. This not only results in an important economy, but it renders the escaping steam noiseless, and the increase of temperature of the water has a tendency to deposit some of its impurities before it is pumped into the boiler. It thus *stops the noise ? saves fuel ? and all engines steam better and faster, and do more effective work with these* valves than with those in ordinary use.

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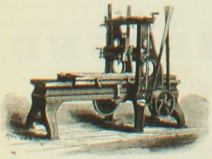

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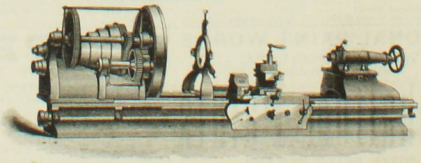

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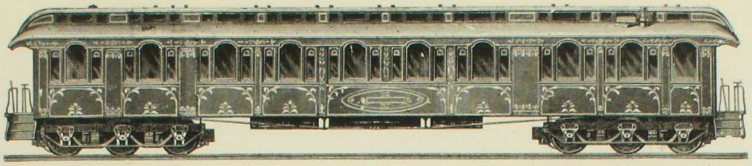


DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

VOLUME XIV } APRIL, 1883. { SINGLE NUMBERS, TEN CENTS,
NUMBER 4. } { $1.00 PER ANNUM.

Miscellaneous Items.

THE Pulman Palace Car Company is building 15 handsome new passenger coaches for the New York, Ontario & Western, which are to be equipped with suspension car trucks and Allen paper wheels.

THE Brownell & Wright Car Co., of St. Louis, are building complete equipment of summer excursion cars for two of the street lines of that city. They have also orders in hand for cars for various other points.

THE Pratt & Whitney Co., of Hartford Conn., recently received the award of the John Scott Legacy Medal by the city of Philadelphia, for Standard Gauges, Taps and Dies, the award being made upon the usual recommendation in such cases of the Franklin Institute.

E. A. SMITH & Co., of Pittsburg, Pa., railway supply agents, expect shortly to introduce a new and improved Switch Lock, which is considered by experts to be a great improvement upon the ordinary locks in use, and one that is likely to meet the approval of railroad men.

THE Litchfield (Ill.) Car Company has an order from the Clifton & Southern Pacific Railway for 16 coke cars, which are to have the United States Car Co.'s dumping appliance. The cars are to be 24 ft. long, 6 ft. wide and 3 ft. deep, with capacity for 8 tons of coal or 5 tons of coke.

WM. S. BOSTWICK & Co., brass founders, Pittsburg, Pa., have added two furnaces to their plant, making eight in all, with a daily capacity of 12,000 lbs. of castings in ten hours. They are turning out 950 car brasses per day, exclusive of rolling mill brasses, and have three months' orders ahead.

THE shops of the Northern Railroad, at Concord, N. H., have completed a new mogul freight engine which has 44 ft. drivers and 18x25 in. cylinders. Its estimated weight is about 40 tons, 36 tons of which are on the drivers. The engine is named "Hanover," and has been under construction a year and a half.

E. & F. N. SPON, publishers, 44 Muray street, New York, issue a monthly list of new scientific books, which is mailed to those who are interested in this class of technical literature. Their list for March mentions, among other recent works, Champin on Details of Machinery; Grimshaw on Saw-Filing; Perry on Practical Mechanics; and Rankine on Civil Engineering.

THE Jackson & Sharp Co. have forwarded to the Canada Southern Railway, ten first-class passenger cars. They are finished on the inside entirely in mahogany, and the panels are very handsomely carved. They have the Baker heater and Williams & Page twin centre-lamps. The head linings are of oak and bird's-eye maple veneer, elaborately ornamented. They have 42 inch Paige Wheels.

THE *Railway World* says that the Philadelphia & Reading road has built a new parlor car, which has been approved of by the officers of the company, and nine additional ones will be finished as soon as possible. They will be of the most approved pattern, and be furnished with particular attention to convenience and elegance. They are intended for use on the Bound Brook route, and the cost will be about $10,000 each.

THE Westinghouse Air Brake Co. has brought suit at St. Louis against the American Brake Co. and D. P. Slatery, President. It is alleged that the defendants are constructing, selling and using locomotive brake apparatus substantially the same in construction and operation as the apparatus to which the complainant has the exclusive right, under letters patent granted to George Westinghouse, Jr. An injunction is asked for, the payment of damages to be afterward determined.

THE Paige Wrought Metal Car Wheel Company, of Springfield Mass., has just been reorganized as the Paige Car Wheel Company, and will remove its works to Cleveland about April 1. The new shops are now being built at Cleveland, and will be 50x100 feet in dimension, and three stories high. The officers of the new company are J. E. French, president; W. H. Paige (the patentee), superintendent; W. S. Dodge, secretary and treasurer. The directors are J. E. French, W. H. Paige, W. J. Watson, C. A. Brayton, Charles Miller and W. S. Dodge.

THE receipts of the Allen Paper Wheel Co., have increased from $286,183 in 1880, the year of its organization, to $782,353 in 1882. The total number of wheels made up to February, 1883, was about 30,000, and of this number the company have not learned of a single instance were death or injury to passengers or employees or any serious injury to rolling stock or road bed has arisen from the breakage of a wheel or an axle used in connection with them. The sales of the company for the month of February were 2,224, as against 667 for the same month last year, and were distributed among 17 railway companies, 4 car and locomotive builders, and 3 miscellaneous parties.

THE Northwestern Car & Manufacturing Company, of Stillwater, Minn., transacts a large business. It has a capital of $5,000,000. For 1882 the following statistics are given: threshing machines, 1,500; agricultural engines, 350; freight cars, 1,493; baggage and caboose cars, 51; common brick, 3,000,000; pressed brick, 100,000; barrels, 175,000. The sales of doors, blinds and office furniture, amounted to $190,000; the number of men employed was 1,200, who received wages amounting to $525,000. The sales during the year footed up $2,272,000. The capacity of the works per day is put at 25 freight cars, 8 threshing machines, 4 farm engines, 20 farm wagons. About 10 passenger and baggage coaches are turned out monthly.

A VERY elegant private car is being built by the Pullman Palace Car Co., for President Sidney Dillon, of the Union Pacific road. It is 62 feet long, 10 feet high, and the standard width. The observation room at one end is 7 feet 6 inches by 9 feet, elegantly upholstered, and supplied with a lounge, which can be converted into a berth. Next to this is a toilet room, with improved folding bed and other furnishings of a first-class sleeping room. The parlor is 18 feet long and elegantly furnished with easy chairs, lounges, organ, fine writing desk, etc. In addition there are kitchen, pantry, porter's room, all supplied with every needed convenience for the uses to which they are devoted. The cost of the car is said to be something over $15,000.

A MANUFACTURER in Marseilles, Ill., in paying wages to his workmen, privately marked $700 in bills, and in two weeks $342 of the money was deposited in the local banks by saloon keepers. This significant fact shows where a large portion of the hard earnings of laboring men go, and why it is that so many of them are compelled to eke out a precarious livelihood from hand to mouth. Sumptuary laws may do something to abate the evil, but not much. So long as the craving demand exists, the sluices which feed it will exist also in one way or another. Arguments addressed to the reason are of no use so long as the reason is in bondage to the physical appetite. Who will invent a nostrum that will destroy the appetite? That is the point.

NEW passenger headquarters are to be erected for the Lake Shore road at Toledo, Ohio. There will be four distinct buildings, a passenger depot, an express depot, a baggage house and an eating house. These will be connected by iron arches and gateways. The style of architecture will be the Norman-castellated, and the plans indicate a combination decidedly attractive, that will add very materially to the architectural beauty of that portion of the city. The buildings will be constructed either of stone or pressed brick with stone facings, in the most substantial style. The passenger building, which will be the largest of the number, will be surmounted by two towers—one of them a clock tower—and will afford room upon the second floor for the offices of the officials located here. The tracks, which will be extended in pairs and will accommodate 14 trains, will be upon the outside of the buildings and the passage-ways to and from the trains will be protected by iron sheds.

RAILWAY men continue to heat their cars with stoves and to light them with kerosene lamps, because the public is at ordinary times perfectly satisfied with stoves and lamps. Mr. Vanderbilt once tried the experiment of lighting his cars with candles, but the traveling public abused him for his alleged parsimony, and demanded to have the kerosene lamps put back. Of course, when a car-load of passengers has been roasted by an upset stove the railway companies are violently abused for heating their cars with stoves, but a month after the tragedy is over the public is again perfectly satisfied with the stoves. A coal stove heats a car to that unbearable degree of heat that the traveling American citizen demands. No other method of heating would satisfy him, for without the sight of a red-hot stove he could not be convinced that he was comfortably warm. The railway companies know this, and they naturally continue to heat their cars with stoves. They are far too intelligent to confound a temporary outcry made by the press just after the occurrence of a railway accident with the real wishes of American railway travelers.—*American Inventor.*

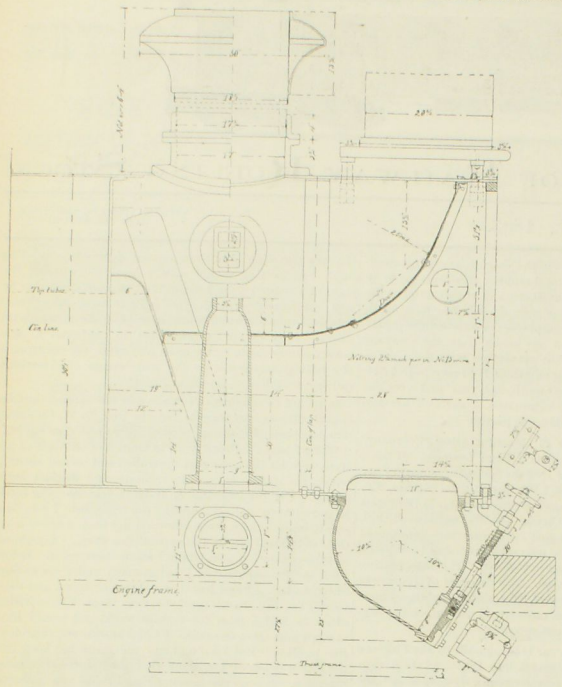
IN regard to young men's chances in railroading, the *Cincinnati Commercial Gazette* reports Gen. D. W. Caldwell, who has been 25 years in active railroad life, as saying: "When I began railroad work in Ohio, the railroads of the state were for the most part controlled and owned entirely within the state. They were separate and distinct companies. The Steubenville & Indiana was one, the Little Miami another, and soon through the whole list. I was then able to know nearly every fellow on my line. I knew what their individual merits and capabilities were. I could select for promotion men whom I knew deserved it. Before I left the Panhandle road I had as many under me as Gen. Sherman has. I knew less than a dozen of them, and those merely because chance threw me near them. I have wished often to find a man for certain work, and would have taken a man from the ranks if I had known one capable of the position. But I did not, and the result has been that the son or nephew of this or that official would be given the place. It is on this account that I think young men in the railroad business have such an unequal chance in the battle they are trying, many of them, so courageously to fight."

MR. F. H. SMITH, of Baltimore, has invented what is termed a wrought-iron three-plate car wheel. The wheel is built of tough elastic steel and wrought iron throughout, with no cast iron in hub or elsewhere, and is claimed to be the only American wheel so built. Many English and continental wheels have full wrought iron centers, but they are light-weight, open-spoke wheels, proportioned to carry light loads on perfect tracks. The Smith wheel, on the contrary, is a closed spoke and plate wheel, a three-plate wheel, thoroughly braced in all directions against any amount of overload, rough usage and rough tracks. The center of the Smith wheel is a cellular box, built of wrought-iron annular web plates, extending from the steel tire to the axle, which plates are stiffened and combined with wrought-iron spokes riveted in between them. Annular boss plates of wrought-iron are also riveted to the outer sides of the web, and, together with the inner edges of the web plates and inner ends of the spokes, they make up a full wrought-iron hub. These boss plates can be omitted in very wide wheels, and in narrow wheels also, by tapering some of the spoke bars, and thus convexing the wheel on one or both sides to the necessary width. For street-car and other wheels of very narrow tread only a two-plate wheel is used, and for locomotive driving-wheels four plates are best.

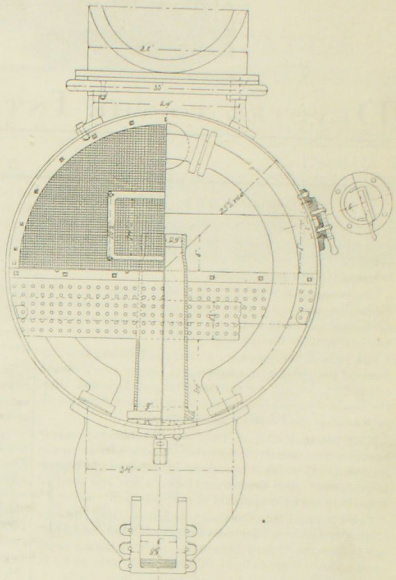
THE California Southern Road is completed from San Diego to Colton, Cal., a distance of 129 miles. The shops at National City are full of work. Three combination cars are in course of construction, and will have compartments for mail, baggage and express. The baggage doors are in the center of car side, and a runway from the ends along the outside enables trainmen to get to the baggage-room without entering the mail or express compartments. The car bodies are made exceptionally strong by the addition of four diagonal brace-sills. These sills are of eastern oak, and are placed between the outside and intermediates. Meeting at the center of the car, they are bolted to the intermediates and are provided there with stout packing-wedges. At the car ends, they run into the corners formed by the end and side sills, and are bolted to the latter, having similar wedges. The roof is made as light as possible; the clear-story sills and plates are dispensed with entirely. The wood carlines are made in pieces and worked on a buzz planer to a templet, after which they are framed together, making one continuous carline running over clear-story from plate to plate. Seven iron carlines are used for each car. The inside finish is in redwood, Oregon pine and Port Oxford cedar. Three new locomotives are under way in the locomotive department. Mr. Berkley Powell is the Mechanical Superintendent.

STANDARD EIGHT-WHEEL FREIGHT AND PASSENGER ENGINE—LOUISVILLE & NASHVILLE RAILROAD.

Continued from Car-Builder for March, 1883.

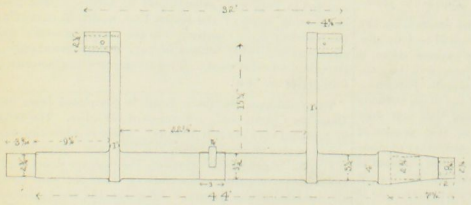


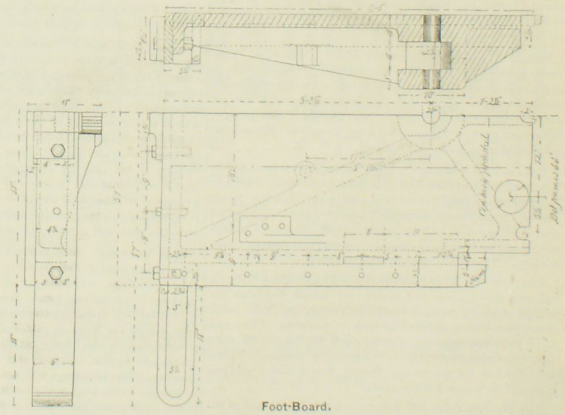
Longitudinal Section.



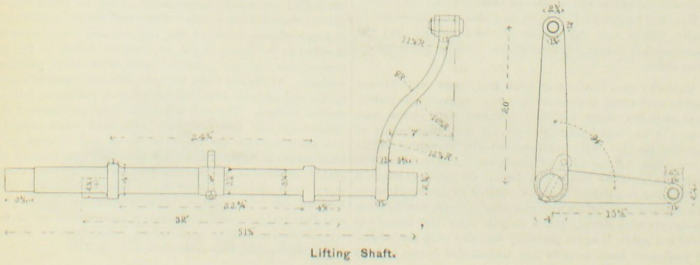
Front View with Cover off, and Section through Exhaust Nozzle.

EXTENSION SMOKE ARCH.





Foot-Board.

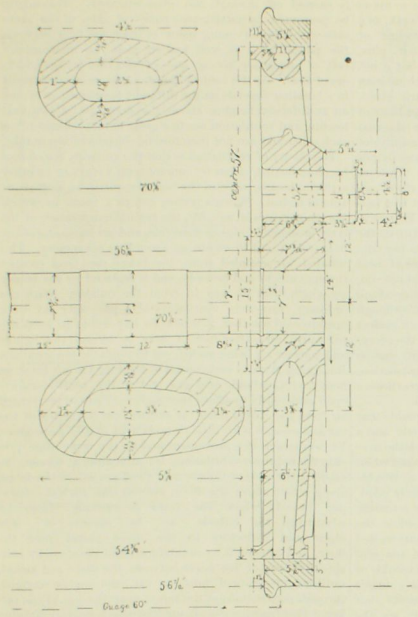


Lifting Shaft.

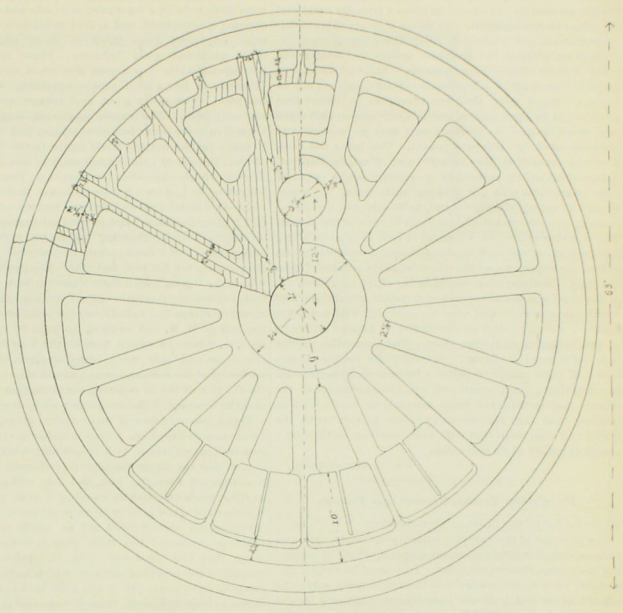
A PAIR of phosphor-bronze slide-valves were recently taken out of an express engine of the Northwestern Railway Co., says an English exchange, after 6¼ years' working, during which time the engine had run 261,182 miles. The engine was a very large and heavy one, weighing with the tender 66 tons. The original thickness of these slides was 1 inch, and they were worn down to ⅞ inch thick. Gun-metal slides rarely exceed eight months' work, when they are worn out. The cylinder faces are described as being in beautiful condition, the wearing being, as it should be, on the valves. At a fair estimate from the present condition of the slides they are capable of from 3 to 3½ years' further work.

"ARE Sleeping Cars Healthy?"—*New York Independent*.

They get off the track now and then, and sustain severe injuries both internally and externally, but otherwise their general health is remarkably good.

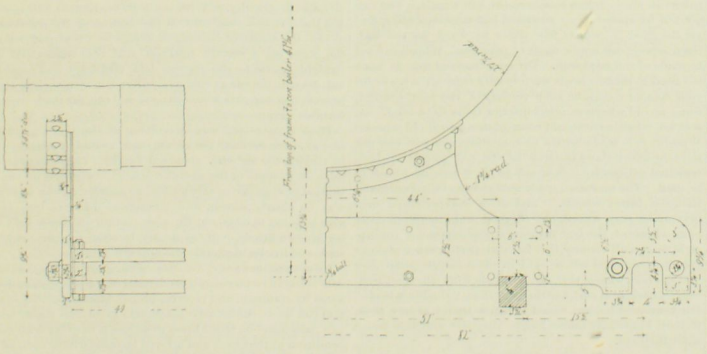


Sections of Driving Wheel and Spokes.



Driving Wheel Showing Inside of Spokes.

Between Hubs, 56⅝ in. Between Rims, 54⅜ in. Between Tires, 56⅛ in.



Yoke and Boiler-Brace.

Communications.

Inventors and the Eastern and Western Railroad Associat ons.

To the Editor of the National Car-Builder.

It is the popular impression that the formation of voluntary associations by railway men is for the benefit of their collective membership by securing to individuals advantages that can not be reached except through organization. There are associations that are not only beneficial to the members of such organizations, but to the community at large, and these should receive the encouragement and support of all progressive people. There are some associations, however, that frequently stand in their own light by the adoption of a narrow policy which contracts the sphere of their own usefulness. They are formed, it may be, for some special purpose, or to compass some particular end, and for a time things work satisfactorily and smoothly. But in the course of time new rules and regulations become necessary in order that the members may receive the full benefits that they have a right to expect. What would be a wise course to-day might have been unwise a few years ago, or may be a few years hence, according to circumstances. As a rule, it is proper that these organizations should conduct their affairs in their own way, provided that legal and private rights are not encroached upon; but in cases where the interests of the general public are involved, it may not be improper for an outsider to venture some suggestions.

After our railway system had got fairly under way, a great and increasing number of patented inventions were brought into use, as a matter of necessity, for the successful operation of the roads and to meet the demands of the public. The railway companies purchased such of these patents as seemed to be valuable, and for a time railway improvements were an inviting field for inventors. It was not long, however, before the offices of these companies were swarming with "sharks" who either wanted to sell patent rights or collect damages for infringements. These gentry had "scooped" the inventors and were ready for a raid on the roads. A company that bought a patent laid the foundation for a score of lawsuits—was, in fact, at the mercy of the patent-right hucksters. The only way out of the difficulty, apparently, was for the roads to let these pestilent fellows severely alone. But this could only be done by an adjustment of the claims already on file. An Association was thereupon formed for bringing about the speedy termination of pending suits, and to protect the roads embraced in the membership from further annoyance from that source. Inventors, it was now thought, were left out in the cold, not because their labors were not appreciated or the merits of their inventions undervalued, but on account of the trouble incident to the use of patented devices. The only safe course for the roads and for the association in which they were represented, was to refuse to adopt any patented improvement until its merits had been properly tested and the validity of the patent established beyond a doubt. This precaution, however, afforded protection only to a limited extent. The purchase of rolling stock and all manner of tools, fixtures and equipment, and the use of them, was sure to bring trouble. Manufacturers of cars, engines and supplies have furnished their patrons with numerous patented improvements in connection with these articles, on which no royalties have been paid, and the result has been a multitude of claims and suits for infringements.

The Eastern and Western Railroad Associations took the initiative in this matter, and for the reasons above stated assumed an attitude toward inventors which the latter interpreted as hostile to their interests. For a time there were grounds for such a belief, and many inventors who had labored to improve railway appliances abandoned the field and exercised their ingenuity in other directions where there were fewer obstacles and an easier road to success in the sale of their products. But experience has shown that the two associations above named have not injured inventors, even if the original intention was hostile, but on the contrary, quite otherwise. The speedy and satisfactory adjustment of a host of claims, which could not have been brought about by negotiation between patent owners and individual road companies, has mutually benefited both roads and inventors. It must be said, however, that the relations now existing between these associations and inventors are not as harmonious as could be wished; and without charging either with being unreasonable in their demands, it is clear that conciliation on both sides is now in order. There is, in fact, a necessity for this in the interests of all concerned, and especially as it concerns the general public, who are deprived of the benefit of valuable improvements in railway operation in proportion to the obstacles in the way of their adoption.

It is manifest that the time has now come for a change in the policy of these associations so far as relates to se-

curing desirable railway improvements. Inasmuch as the inventors are now practically in their power, it remains for the associations to extend to them a friendly hand and all proper encouragement. As things now are there is discouragement, and mainly in this: The great mass of inventors are without the requisite means for testing the value of their alleged improvements. Railway managers, under the pressure of a burdensome traffic, can not attend to the testing of more than one invention in twenty that are brought to their notice, and it may happen that some very valuable and meritorious ones may go unused and unappreciated for this very reason. This being the case, it would seem that the Eastern and Western Railroad Associations, either separately or jointly, might organize some practicable plan for making such tests. It would require an outlay of some capital, to be sure, but the assessment upon each road would be small in view of the benefit that would result. The whole lot of new devices awaiting recognition (except such as are obviously worthless) would go into one hopper where the wheat would be separated from the chaff. Railway men would be benefited by getting rid of the chaff and the annoyance of constant solicitation, and worthy inventors would also be provided with a market for their wares, as well as stimulated to greater exertions in the bettering of rolling stock. The sooner this matter is taken in hand the better. Several plans for the organization of what might be called a Bureau of Experimental Research have been suggested, but the experience of the officers and members of these associations would seem to indicate that they are the proper ones to take both the initial and final steps that will make such an institution a practical reality at an early day.

WM. S. HUNTINGTON.

Freight Car Trucks, Present and Future.

To the Editor of the National Car-Builder:

The increase of the carrying capacity of freight cars, and of the speed of freight trains, are questions that are assuming more importance every day. In regard to weight and capacity of cars, the tendency is toward a point when the weight of car and load will approximate that of a freight engine. A load of 40,000 lbs. per car is no longer regarded as a maximum, and the progressive railroad men are already talking of 60,000 lbs., and also of an increase in the speed of trains. In view of this tendency, the question arises as to what changes are necessary to be made in our present styles and standards of construction to meet these new conditions. There are freight trucks now running that show signs of weakness with present loads, not from any essential fault in their design, but because they are too light in their construction. The diamond truck, now so extensively used, is an example of this. The top bolster is usually made of 8×12 inch oak, and trussed with 1 inch rods, yet it shows a surprising weakness under heavy loads. This, it may be said, can be readily overcome by decreasing the thickness of the lower bolster and increasing correspondingly that of the top one. This, however, is little better than a make-shift; and as the size of oak timber is becoming more and more expensive and harder to get, it would seem to be only a question of time as to replacing it with iron, so far as this class of bolsters are concerned. Whatever style of iron construction may be adopted with a view of securing greater strength and safety, must be as simple as possible in order to avoid too frequent repairs.

As to the matter of increased speed, it will be necessary to make some important changes in running gear construction to prevent a great increase in expense from ordinwear and tear, to say nothing of breakages and wrecks. Our fast freight trains now run at a rate ranging from 25 to 35 miles an hour, and it is next to impossible to prevent nuts from being shaken off the trucks. Some of the bolts are of the greatest importance, and if a nut is lost from one bolt, an additional strain is imposed on others, and not unfrequently the heads are broken and a wreck is the consequence. There must be some remedy for this, and I would suggest that all important bolts in a truck have a single nut instead of a double one, and that the bolt be drilled for a cotter key. With such a key it would be impossible to lose the nut or the strength derived from it, as I know from actual experience. It may be said that this would be too troublesome and expensive; but it is certain that any additional expense would be doubly offset by the saving of a nut on each bolt, the shortening of the bolt, and the cutting of thread for one bolt instead of two, to say nothing of indirect savings in various ways that need not be enumerated.

R.

Locomotive Eccentrics.

To the Editor of the National Car-Builder:

What piece of machinery is there about a locomotive that give less trouble than the eccentrics? In a ten-years experience on the foot-board, from a 4-wheel outside connected shifting engine at 10 miles per hour, blackboard rates, to a passenger engine with a card time of 45 miles per hour on a road of 200 engines, I never have run across a hot eccentric, much less a broken one. Scientific effusions are met with occasionally about the dangers incident to eccentrics, of "surface friction," and the "great surface in contact." They are said to be perfect receptacles of dust and dirt. But these objections come from men who never use them in a practical sense. Locomotive engineers hardly know what an eccentric is, because the late fashion of keying them in place, or in using a die with teeth held by a set-screw, is so safe and sure so far as slipping is concerned, and as they never heat or break, as a rule, engineers loose track of them on account of their universal good behavior. There are hot pins, hot driving-axles, hot engine and truck axles, but a hot eccentric is like a dead mule—something which no man has seen. I once saw a hot and broken eccentric strap, and only once. The master mechanic was a graduate of Cornell or some other technical school, had been educated to make perfect fits and could figure to the thousandth of an inch the size of cylinder necessary to just slip any pair of driving-wheels—knowing the weight on them. While at his school he had seen it demonstrated that a surface calculated to stand a given frictional pressure, must be a perfect "groundsurface" and in "actual contact." There was an engine in for overhauling, and he had it fitted up on the college theory of "dead surface of contact." On her trial trip, among red hot pins and other manifestations of heat which the "gang" with their water buckets could not control. I distinctly remember disconnecting her two go-ahead eccentric straps and rods, the straps being broken, although the college M. M. had ordered them to be made a perfect fit *i. e.*, when the wheels were on the floor and the eccentric straps and rods were bolted to place, the fit was so perfect that the rods and straps would stay in any position, the friction of the fit resisting the attraction of gravitation and the leverage of the eccentric rods to descend.

This is the only case of an eccentric giving trouble that I ever saw or heard of. Given a cast-iron eccentric and a cast-iron pair of straps, with an ordinary working lathe fit—*i.e.*, so that the straps can be revolved easily by hand when disconnected from the link, and they will give no trouble in three years of ordinary running if kept properly oiled, whether the speed is 10 or 50 miles an hour. Let scientific investigators and writers aid as much as possible the practical workers; but their time is worse than wasted when they kick up a row with the quiet and peaceful eccentric, the practical users of which have no trouble or cause of complaint. It is the rule in locomotive repair shops to find cylinders, frames, rods and eccentrics that have been in use 25 years, and it is not easy to see the necessity of doctoring or removing them, as they are the last things in an engine to heat, or wear out, or get broken in a wreck.

COMO.

Good Car Wheels—How to Get Them.

To the Editor of the National Car-Builder:

Next in importance to the track come wheels. They carry all the traffic. If they are inferior all goes wrong. They are the most expensive item in repairs. Too much pains can not be taken to secure the *best* wheels. You can not tell by appearance; good and bad may look alike, and yet the good be worth five times as much as the bad. Good wheels can not be made of poor iron. Wheels can not be made of too good iron. The best charcoal iron is none too good to make wheels of. Specify that all wheels for your company shall be made *entirely* of the best charcoal iron; no old wheels or other inferior irons to be used. Do you ask what harm would come of using good old wheels? Wheel iron is made brittle by remelting, and you can not tell how many times the iron in the old wheels has been remelted; therefore it is unsafe to allow any old wheels to be used. The increased loads now carried in cars demand stronger, better wheels. Careless or inexperienced men may make poor wheels out of good iron, therefore order your wheels of the best makers, whose character for uprightness shall insure the faithful performance of your specifications, and whose skill in manufacture shall give you the best wheels that can be made from the best iron. Such wheels will cost a little more than "shoddy wheels," but your stockholders would demand that you buy them if they knew how much longer they last and how much safer they are.

The Warming and Ventilation of Passenger Cars.

To the Editor of the National Car-Builder:

Although these twin subjects have been discussed almost to exhaustion, it is a fact, nevertheless, that there is no very great amount of positive information extant in regard to them. Cars designed with special reference to thorough ventilation too frequently turn out utter failures, while on the other hand there are cars built twenty years ago or more, with no raised roofs and with no special provision for ventilation, that are superior in this respect to many modern cars, in the construction of which particular attention has been given to this matter.

Rules and formulas have been prescribed to improve the acoustic properties of public halls and buildings, but it appears to be generally admitted that the good results obtained have more often been due to accidental features and surroundings than to any system of definite or fixed structural proportions with reference to the effect desired, and this is true to a considerable extent as respects the warming and ventilation of cars. It is a fact not generally recognized that any heated apartment loses its heat proportionally as its temperature is above that of the outside air, and that the loss of heat in a car is much greater on account of the large area of glass in the windows, the glass, although a bad conductor, being a far better absorbent than radiator of heat. It has been said that at least 25 per cent. of the heat which a car loses while in motion is carried off through the glass windows. This might be prevented by putting two panes of glass in the same sash with an intervening space of half an inch between the panes, as it is well known that an intermediate belt of stationary air is one of the best non-conductors of heat. As the ventilation of a car or an apartment in a building depends on the different temperatures of the air at different heights above the floor, it follows that heating and ventilation are to a great extent dependent on each other, and can not therefore be considered separately.

The theory of ventilation is that the air in an apartment becomes heated, either by contact with a stove or by other artificial means, or from the heat generated by human or animal bodies. When a person enters a room in which the temperature is, say, 65°, the normal temperature of his body is about 33° higher than this, and an excess of 4° of heat is sufficient to create an ascending movement. The vitiated air exhaled from the lungs rises and escapes through cracks and crevices, and is replaced by the colder air which finds its way in from the outside. With the ordinary clear-story ventilators of a passenger car wide open in cold weather, it is next to impossible to keep the car warm, no matter how it may be heated, the lighter and warmer air being sucked out through the top openings. But unless there is some outlet at the top, the air becomes heavy with carbonic acid gas, and if the ventilators are open sufficiently to afford thorough ventilation, the heated air from the stoves takes the shortest cut to the top of the car and escapes with little or no benefit to the passengers. To counteract this movement and at the same time provide the requisite ventilation, let an exhaust opening be made at the ends of the car near the floor, say in the doors, about a foot above the floor, keeping the forward opening closed when the train is running. Then by admitting the outside air by means of side pipes and deflectors to the stove jacket near the floor, and causing it to circulate around the stove by suitable divisions of the space between the stove and jacket, until it is discharged into the car, thoroughly warmed, through perforations at the top or near the top of the jacket. This fresh, warmed, unvitiated air, instead of being let out and wasted through the deck ventilators, is kept in the car, and as it accumulates by being constantly forced into the jacket by the outside pressure in the deflectors, it must necessarily force out a corresponding volume of cold air from near the floor through the end opening in the rear door, thus equalizing the temperature in the car by maintaining an upward movement of warm air and at the same time a downward movement as it becomes cooler. That this is the direction of the currents under the conditions named has been repeatedly demonstrated both experimentally and practically. With the deck ventilators half open and the exhaust ventilator at the bottom of the car door closed, the smoke of burning shavings in a coal hod near the stove (in a certain trial test that was made) took a straight course to the nearest deck ventilator and passed out, leaving the car as cold as a barn; but by reversing the process the currents were changed and the car made comfortable again.

There is no better way of getting at the truth in this matter than to make the air currents visible by smoke, or by tinging the air with chemical fumes. The defects and fallacies in some of the so-called scientific methods of ventilation now in use in cars and other structures, can in this way be clearly shown, and theoretical currents that are sure to come in or go out through certain apertures under certain conditions, will frequently be seen moving under such conditions in exactly the opposite direction.

No system, however, for the heating or ventilation of cars is likely to be entirely successful unless it is well under stood by trainmen and receives proper attention. No system can be so completely automatic as to run itself, nor can passengers be relied upon to adjust it to every varying condition so that each and all will be comfortable and satisfied.

SOUTHERLAND.

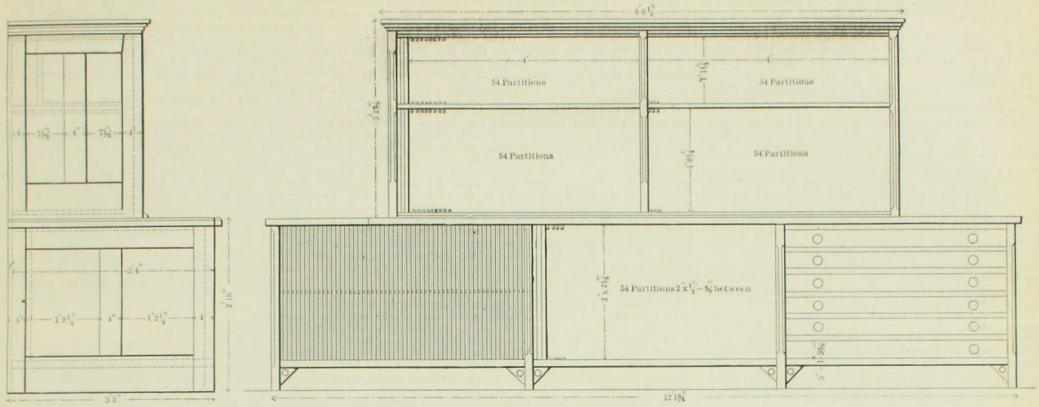
Car Seats.

To the Editor of the National Car-Builder:

I am glad to see that at the February meeting of the Car-Builder's Club, a little attention was given to the subject of car seats. Seat frames, as is well known, are usually made with heavy side-rails in front and rear, which worry and annoy the sitter. Many seats are rounded up in the center to raise the occupant from the side-rails, thus placing him in a position about as uncomfortable as if he were sitting on the side of a barrel. As a remedy for these inconveniences, a seat has been designed in which side-rails are dispensed with by the use of edge-springs, which form a straight, strong, elastic and durable edge, stronger if anything than the center, and easy and convenient to upholster. The surface of the seat may be flat or rounding. If the latter, the weight of the occupant will make it concave, with no inclination to slide off. The cushions have no "parallel" for the seats and backs in sleeping cars to form the lower berth, being entirely free from the back-breaking side-rails where the two slats meet, and making a full-length, continuous and pleasant bed. These springs are also well adapted to seat backs and can be made either convex, or concave and as soft as can be desired.

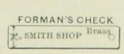
E. L. BUSHNELL, Poughkeepsie, N. Y.

CABINET FOR KEEPING BLUE PRINTS—CHICAGO, BURLINGTON & QUINCY RAILROAD.



End Elevation. Front Elevation.

The size of partition is 2 × ½ inches. The number in the rack or the letter of drawer selected for any print, should be stenciled on back of print at center of each end in ⅝ or 1 inch figures. When a print is taken to the shop the foreman of the shop should leave his check on partition to right of print in the case.



Half Size.

Form.

LIST OF STANDARD BLUE PRINTS

TITLE.	DATE ISSUED.	SHEET NO.	WHAT CARS.

The engravings illustrate a cabinet for the systematic filing of blue prints in railroad offices. This system is in use at the shops of the Chicago, Burlington & Quincy road at Aurora, Ill., and was designed by Mr. G. W. Rhodes, the Superintendent of Motive Power, and Mr. Wm. Forsyth, Mechanical Engineer of the road. The following explanation of the manner in which the system is operated has been furnished us by Mr. Rhodes:

All drawings are sent to the shops in the form of blue prints, and the original drawings are, therefore, tracings from the lead pencil copy on paper. The drawings are divided into three classes: 1. For standard locomotives and cars bearing numbers from 1 to 1,000. 2. For shops and shop machinery, roundhouses, turn-tables, pumping stations, etc.; these bearing numbers above 1,000. 3. Drawings of a temporary character for experimental or special work, these being called "specials," and designated by the letter S prefixed to the number proper. The tracings are kept in a cabinet which is divided into pigeon-holes 13¼ in. square and 36 in. deep, by horizontal partitions 1¼ in. thick, and vertical partitions made of sheet-iron to economize space. Each individual tracing has its own pigeon-hole with its number above it, and by the construction here described, it is possible to have more than 600 tracings in a cabinet 3 ft. square. The number of the pigeon hole corresponds with the number of the tracing in it. Standard sheets are 26×40, 20×26, 13×20, and 10×13 in., and also a letter size 8¼×10¾ in. With the exception of the letter size, the sheets are known as full sheets, ¼ and ⅛ sheets, these fractions representing their relative size as compared with the full 26×40 sheets.

The importance of having uniform sizes for standard blue prints applies not only to the care of tracings and prints in the draughting room, but also to the mounted prints in the shop. With such a system it is possible to keep a large number of mounted prints in compact shape and so that any one of them can be readily found.

The title of the blue print tracings is entered in the catalogue in two places—first, according to its subject, and second, according to its number, the latter list having the numbers consecutive, while the former are not consecutive. A card catalogue is also kept, in which the titles are indexed alphabetically. These cards give the title, the sheet number, date, and size of sheet. The record of blue prints sent out is also kept by cards headed respectively "Title" and "Sheet No.;" the former having spaces for sheet number, date and size, and the latter the number sent, to whom, place and date of sending and receiving. Each foreman is furnished with corresponding checks as follows: Machine shop, 25; boiler shop, 10; smith shop, 25; wood shop, 10; freight shop, 25; coach shop, 25; paint shop, 10. The card catalogue and the card record are kept in drawers properly divided and marked with numbers and letters, so that any card can readily be found.

The blue prints are mounted by the cabinet makers in the following manner: The print is sponged thoroughly on its blank side with clean, warm water, and a sheet of heavy brown wrapping paper is treated in the same manner at the same time. The brown paper is thus applied to a sheet of stiff pasteboard $\frac{1}{16}$ in. thick, with thin glue, the paper covering the edge and lapping over ½ in. on the side. On the side opposite the paper, the print is carefully and evenly glued on, and in a few hours it is ready for three coats of white shellac and varnish. A tin corner-protection is then riveted to each corner of the card and it is ready for use in the shop.

THE Pintsch Lighting Company, of New York, are equipping 84 cars for the New York, West Shore & Buffalo road, and 65 cars for the Chicago & Atlantic road, with their patent oil gas lighting apparatus.

March Meeting of the Car-Builders' Club.

CONTINUOUS TRAIN BRAKES, BRAKE SHOES, ETC.

The Club met on Thursday evening, March 15. The President, after announcing the subjects for discussion, introduced Mr. George Westinghouse Jr., of Pittsburg, who addressed the club as follows:

MR. PRESIDENT: In regard to continuous brakes, I think every one of you is familiar with their use on passenger trains, which has now extended over a period of ten years, and has made us acquainted with their general principles. With passenger trains it is much more desirable to stop in a very short distance than with freight trains, and to bring about the best results on passenger trains, it is necessary to apply the brakes to every wheel; and to make the stop in the shortest distance, requires not only the application of the brakes to all the wheels of the train, but such application must be made without the loss of any perceptible time and with exactly the degree of force that is necessary to produce the best result. Now that degree of force I had the pleasure of ascertaining in connection with Captain Galton of England, and it was found to vary very much. Running at 45 miles an hour, an application of the brakes with a force equal to the weight of the wheel would cause the wheel to slide. At 60 miles an hour, four times the weight of the wheel on the rail against the blocks on that wheel will not cause it to slide. Another point was that a brake shoe when first applied appeared to hold a great deal more the first second than it did the next second, and go on decreasing, that is, providing a regular speed were maintained. So the question of bringing about the proper application to the wheel's of passenger trains is a very complicated one. With these trains it was found that if you had any way of automatically regulating the force, that the force should be equal to about 1¼ times the load on the wheels on which the brakes are acting. That is, a 30,000 lb. car would require about 45,000 lbs. of brake shoe force to produce about the best results you could get. When we come to freight trains we have a totally different problem. Passenger cars are almost always of the same weight. The load from passengers is an immaterial part. With freight trains, the load varies from the empty car of say 20,000 lbs. up to about 60,000 lbs., so that to proportion the brake force to the weight of the car seems almost an impossibility. But in these experiments with passenger cars it was clearly shown that any ordinary coupling apparatus could hardly stand the strains produced by the slight irregularities in the action of the brakes; that is, the brakes are applied a little sooner in the front of the train than in the rear. The consequence is, the cars are first jammed together, and as soon as the brakes begin to act with the same force on the rear of the train, there seems to be a stretching out of the train. On freight trains, that difficulty was greatly increased by the amount of play between the cars and by the length of train. If you jam the cars together by 20 feet, as they do on some European railways, then the reaction of 20 feet will break nearly all the draw-bars. If we were to undertake with our present draw-bar apparatus to apply the brakes equally to the whole of a freight train, it would, I think, be impossible to keep the train together. So in practice, as far as I have gone myself, I have limited the breaking force to about $\frac{1}{10}$ of the weight of an empty car, and in that way have altogether avoided sliding the wheels. In applying the brakes to freight cars we have had the advantage of the opinions of railway people and others, and it has been impressed on us that whatever we do, we must make a brake automatic in its action to provide for a train breaking in two. The Pennsylvania people, who have three trains fitted with the brake, proposed, at first, to fit them with the old non-automatic brake. But after getting our views, they concluded they would wait until we could produce an automatic brake, because an examination of the records of accidents on their heavy grades and other places, showed that nearly all the serious accidents arose from trains breaking in two, and that any brake that would not be applied by the separation would be valueless. I think the statement I have made answers pretty well the question of leverage; that is, for a passenger train the leverage must be such that the force usually applied—that is, in the case of high-speed trains—will make the brake-block force equal to the weight of the wheels of the car that are acted on by the brakes. The leverage with freight cars should be such that the ordinary force will bring a force against the wheels equal to $\frac{9}{10}$ of the weight of the empty car. Now it is possible that later on, when we have much stronger couplings and shorter trains running at higher speed, it will be possible to increase the proportion of brake force for freight trains, and that at the same time the load itself of the car may be utilized for varying the leverage, so that the brake force shall always be in proportion to, say, $\frac{9}{10}$ of whatever the load of the car is. This matter of making the body of the car act as a fulcrum for the levers is one to which I have given attention. I find that a number of railway people also are giving that subject careful attention, and that several patents in relation to it have been taken out. We may take it for granted that starting with $\frac{9}{10}$ of the load of a freight car, we shall have about all that a train will stand. That is to say, if you put on a force equal to the weight of the car, I think the couplings would be broken so frequently you would all vote the brake a nuisance.

In regard to the next question, the position of brake-shoes, I do not think you could get two men to agree. I think every one of you have noticed the clattering of the brake-block as you go along. That results from this thing (illustrating) being about on the centre and jumping along. If you put the centre of the brake-shoe about three, or four, or five inches below the centre, you stop that altogether. Our experience in England showed that where a single block is applied to one wheel it was a great deal better to put it from 3 to 6 inches below. When you put three blocks on a wheel, then you have to put them in the centre. We had considerable amusement with reference to the vacuum brake. That brake would shake the passengers very much, and this effect was attributed to the irregular action of the vacuum; but in examining the carriages fitted with that brake, it was found that $\frac{1}{3}$ of them had the shoe on the centre, and that caused all the difficulty. If they had put the shoes below, the trouble would have been avoided.

The next point is the number of shoes per wheel. The first experiments I made with double shoes for each wheel showed conclusively that for some reason or other, which I have not been able to explain, the cutting action of the wheel on the block seems to be a good deal more—say you have 100 lbs. per square inch; you double that, and it is more than double the iron cut away. Putting the blocks on a wheel has the advantage, then, of saving in the amount of metal used in braking. There is a further advantage in the use of two blocks on on each wheel, which is very considerable. In applying the brake to one side of the wheel, taking the proportion I have given you, say 5,000 pounds, you would have 7,500 pounds applied in that direction. Now the box is less than half the circle, and the tendency of this immense force is to shove this axle out of the brackets over against the box, and to do that requires a movement of the brake shoe a good deal further, and the result is that the piston of the cylinder in the case of the air brake requires 9 to 12 inches for efficient braking. Put the blocks on both sides of the wheel, and it takes only 5 inches. That, I think, is a practicable thing for passenger cars, but not for freight cars. The apparatus would be too expensive. There is another difficulty when you use one shoe. If you have 1½ times the weight of the car, the movement of the piston will be a great deal more than if you apply force equal to about half the weight of the car or less.

The next subject is the number of shoes per car. We have

in this country for passenger cars a great many six-wheel trucks, and it seems almost impossible to get a brake on the middle pair of wheels. The application of the brakes to the middle wheels will make a difference at 50 miles an hour of about 100 feet. So it seems that the application of the brake shoe to each wheel of a car is a matter of very great importance. You can do a given amount of braking with the application of a good deal less force, by distributing it equally over the wheels, and the consequence would be a decrease in flat wheels and a longer wear of the brake blocks.

There are some other points in this question of freight car brakes. The whole subject is one that I think has received a fair share of attention already, but the difficulties in the introduction of a freight brake seem almost insurmountable. You have 600 or 800 railway corporations at the present time. Every master car-builder thinks he has the best apparatus, and each one wants his own, and it is almost a necessity to have a uniform brake in this country. If we can get a brake such as the master car-builders asked for a few years ago, that is, one that would not cost more than $5, that would be perfectly independent in each car, it would be a good thing. But I have not found that you can get the sort of brake you want without having a connection from car to car. You want a brake that will apply itself in case it gets out of order. You want something that if it does get out of order will rather stop the train than allow it to go ahead: then you want also a brake that in the event of the coupling coming apart will instantly stop both portions of the train.

If it is necessary to have a brake that will act if the train separates, then you can not get anything to do that unless each car has its own apparatus for applying the brakes which will come into use by the very act of separating the cars; and to get that, of course, requires more or less cost and more or less complication. What you have to consider is, have you enough benefits to expect from the application of the rather costly and complicated apparatus, to justify you in going to the trouble and expense of putting it on. I think you will have reason to feel that if you go into the thing thoroughly that the cost will be much higher than your $5—twenty times higher—that is, the application of brakes to freight cars would, in my opinion, enable you to run at enough higher speed and do enough work to be equivalent to more than one-fifth of the car equipment. Now that means $120 a car. If you can go to the expense of fitting the cars with a proper brake, if the benefits justify the expense, then I think you will not hesitate to choose that brake. I do not mean *my* brake, but any brake which will prevent the greatest number of accidents. The accidents on the railways to-day are something frightful. I do not see how they get men to work on them. Every thing of that kind makes the question not only one of economy, but something above that. We have applied the automatic brake to 75 cars on the Pennsylvania road, running in three separate trains of 25 cars each. They have been running about a year, and are giving, I believe, good results. We have the same brakes applied on the Denver & South Park Railway, where the gradients are 212 feet to the mile, I believe. We have experimented with a brake on 50 cars on the Pennsylvania road and found that there was no difficulty whatever in operating brakes on trains of that length. I think we have solved the problem, so far as it can be solved, as to the practicability of a device of this kind on freight trains of any reasonable length.

A subject mentioned in one of the circulars was, could continuous passenger train brakes be used on freight trains? The advantage to be derived from the use of apparatus similar to what you have on passenger trains is considerable at the present date. You have the experience of ten years now with continuous brakes. You know what one class of brakes, at least, will do. Now we have an addition to the brake I speak of—a numerous class of buffer brakes. It is hardly in order for me to speak of buffer brakes, but there is some information which I have gathered bearing on that subject that I think will be of use to you. As I said before, the application of the brakes has a tendency to jam the cars together, and if you apply very powerful engine-brakes, the force with which they are sent together is sometimes very great; but the buffer brakes, as I understand, are intended to be applied by the pressure between the cars, and that pressure is brought about by applying brakes to the engine. The brake next to the engine will be compressed with the greatest force. The brakes are applied with a little less force to the second car, and so on to the end of the train, until there is no brake force at all. The application of the brake force to quite a proportion of the cars tends at the same time to retard the train and to lessen the pressure from the engine, and I think it would be utterly impossible to get any force on the last cars of a train. They would be braked to some extent, but the force applied would be so slight as to be practically of no account in stopping the train. But when we come to this question of buffer brakes, the advantage is a great one, but you can never make a buffer brake that will apply itself when the train separates, because these brakes are made so that the pressure is taken off by the separation of the train. And I think, for that reason, that, however good a buffer brake is, there is a class of accidents to be prevented which it does not provide against, and which you will have to provide against.

BRAKE SHOES.

The President: I think there is one question that has never been satisfactorily settled, and that is, what kind of material makes the best brake shoe, taking into consideration all the advantages and disadvantages.

Mr. Westinghouse: In regard to that point in the experiments I spoke of, as having been made by Captain Galton and myself, we had cast-iron brakes. It was the ordinary iron, I suppose, and was moderately hard. We faced those with wrought iron, and we made experiments at all times, in dry weather and wet weather. The wrought-iron block on the wrought-iron tire had a very peculiar effect. We had an apparatus which was practically a weighing machine, and it automatically recorded exactly the lifting force resulting from a given amount of pressure; and it also recorded the force that was exerted against the block. The wrought iron did not appear to hold very well. It would go on for a considerable time, and all at once it would seize the wheel and cause it to slide before it made half a revolution. We had pieces of wrought iron weighing an ounce torn out of the shoe. On French railways, were they used wrought-iron blocks, though they have since abandoned them, I have seen pieces the width of the brake shoe, and six inches long, torn either out of the wheel or shoe—I do not know which. The cast-iron shoe showed conclusively that with a given amount of force it held a great deal better than the wrought iron, and not only that, but it held much more uniformly. You had not the difficulty of having with wet rails and dry rails an immense variation. With the wrought iron and wet rails the moisture seemed to grease the thing up. With cast iron we never perceived the same effect. It always seemed to present an unpolished surface. While studying on this subject, I came to the conclusion that the holding power of the block is very nearly in proportion to the amount which will wear off. A wooden block on a dry rail, will hold about twice as well as an iron block on a wet rail. If you make a block that will last forever you will have one that will not hold. You are presented with brake blocks for trains which are recommended as very durable—maleable shoes for instance. They seem to last four or five times as long as a thick cast-iron shoe. I believe you will find the kind of shoe that you should employ is one of moderately hard iron. It is said that the Congdon shoe lasts well. In making that shoe bits of steel or iron are laid in the mold and the iron is poured around it. I do not know whether that holds better or not, but I have found that a shoe can be made to hold a great deal better by cutting grooves across it. That I can explain by the fact that the innumerable little rollers which get on the wheel and make the difference in the holding power of the shoe when first put on, and a few seconds after are let out by means of these grooves. But that explanation is, of course, merely speculative.

The President: The present freight equipment is fitted with four shoes to each car, that is, on one truck, and there has been some discussion as to whether it would be advisable to fit the same number of shoes to passenger cars, that is, shoes to the 8 wheels—whether the expense attending the application of the other four shoes would be offset by the advantages gained, using the hand brake, as we do at present.

Mr. Westinghouse: The freight brake equipment, and generally that under tenders, is too shabby for any mechanic to put on. I never saw such a rattletrap. It is hung up by little rods, anyone of which, if it breaks, will drop the whole apparatus. I believe a large proportion of the accidents are caused by that. A brake gear can be put in at a cost not exceeding by $5 what is now used, that will be safe. I have seen hundreds of brake beams and levers lying on the road. I do not believe you can ever have good results from your brakes, whether hand or continuous, until you put on a proper apparatus.

Mr. Fry: It is a noteworthy fact that on 35 per cent. of the freight equipment the brakes are suspended from a part of the car that is constantly varying in height. The western people generally suspend their brakes from the body of the car, which is at one height when it is empty and at another when it is loaded, and very few of the cars that I know of have their brakes suspended from the fixed point of the truck, which is the lower bolster?

Mr. Westinghouse: In dealing with that point, we have simply been obliged to make the cylinder long enough to shove it right out. A good many cars have the brakes out here (illustrating), suspended at the upper part of the car. That is not mechanical, but it answers pretty well, because it is a convenient brake apparatus to get at. What ought to be done with a freight brake, and I think the other benefits would justify it, is to spread these wheels apart a sufficient distance, so that you can get your brake beam and every thing up alongside this timber, and to suspend the brake by some apparatus fastened to that lower point. This point (illustrating) on a diamond track remains always at a fixed distance from the rail, and this upper plank is the one that moves. But I have recently seen cars on the Pennsylvania road, which I think were Missouri, Kansas & Texas cars, which seemed to have a very excellent frame, so far as the brakes are concerned. There are two timbers and the springs are put in between. Now, that affords a very excellent place for applying the brake. The only defect that I have seen is that the distance from the wheel to this timber is not quite sufficient to get a brake beam in.

Mr. Fry: As I understand it, you have been able to meet the difficulty, but that it would be much easier if you had a good truck to work on.

Mr. Westinghouse: Yes. We have, you know, a different problem from what we had a few years ago. You have cars that carry 50,000 pounds. The truck is to be made to carry that. If you could design a car that would have room for the brake, it would be a good deal better than to go on with the present apparatus. We are presented with some very difficult problems in this brake matter. We recently had a drawing of a narrow-gauge engine sent us, on which we were asked to fit a brake. The distance between the wheels was about an inch and a half. The engine weighed about 70,000 pounds. It was impossible to get a brake on that.

Mr. Fry: You say you are now able to brake 50 cars. Would you be able to brake 75 cars if you had a well designed truck?

Mr. Westinghouse: Yes, sir. But I think a train of 100 cars would be a sticker. We can not operate brakes on that number of cars. But we got up a valve that we can put in, say on the thirtieth car in a train, and the air will go through from the engine to the back of the train to charge it. In that case you can use the first thirty cars for slowing up. In case of emergency this valve opens and lets air out of the rear of the train, and in that way I think I could brake 150 cars. As to braking 100 cars simultaneously from the engine I do not think it can be done.

Mr. Fry: A braking force on 15 cars is as much as we can get, and it is only in very extraordinary stops that you need to get the pressure on the balance of the train.

Mr. Westinghouse: The economy of brake shoes is very great where you limit the brake force as is done by distributing it over all the wheels of the 30 cars.

Mr. Goodwin: In case this automatic freight-train brake should come into general use, it would, as I understand, be desirable to have this valve car at spaces in the train.

Mr. Westinghouse: Yes.

Mr. Goodwin: Wouldn't there be difficulty in adjusting your train?

Mr. Westinghouse: The valve I refer to is a portable valve that a man carries and inserts in the coupling when needed.

Mr. Goodwin: Do you apply the brake to all the eight wheels of each car or only the four?

Mr. Westinghouse: We have applied it to eight.

Mr. Goodwin: Is this automatic freight train brake identical with the passenger automatic brake?

Mr. Westinghouse: In some respects it is a superior apparatus. The automatic brake for passenger cars we put on before we had much experience. Now we have been guided by experience and the triple valve we put on has identically the same action as that on the passenger cars, but we have got the thing in better mechanical shape. If you get very large cars, and we have to brake up to two or three times the amount we are doing now, we will have to separate the reservoir from the brake cylinder.

Mr. Goodwin: And what will the price be, per car?

Mr. Westinghouse: For freight brakes, there being so many more of them, $50 a car is the price fixed, and we have had a consultation and have almost decided to allow, for this year, a discount of 20 per cent. The price this year would be $40.

Mr. Goodwin: The apparatus put on the engine costs the same?

Mr. Westinghouse: The same. We have a pump and a main reservoir, two brake cylinders for the driving wheels, and a great many fittings, and we are making an excellent profit out of that simply by having special machinery to make all that. We do not see our way to reducing that price. We thought it better to make the price as low as we could on the freight cars, and keep the price for the engines the same for passenger and freight engines, because freight engines are often used for passenger service and passenger engines for freight service.

Mr. Forney: As I understand, the principle of the freight train brake is precisely the same as the passenger brake, and the appliances used on the locomotives are identically the same; but that the apparatus which is used on the freight cars is not the same as the apparatus used on the passenger cars.

Mr. Westinghouse: Yes, sir.

Mr. Forney: Would it be possible to use the freight train brake on a passenger train?

Mr. Westinghouse: Not with good results, because it is not large enough. Two sets of freight car brakes put on a passenger car would be just about the right capacity for a passenger car. As I say, if you get cars too large, we will have to use the passenger style—separate reservoirs.

Mr. Fry: If a freight car brake were fitted with an automatic attachment, could it be connected and run with a passenger train?

Mr. Westinghouse: Without any difficulty. We have had that in view. We believe it would not be desirable or advisable to have a different apparatus. On many roads they order a brake apparatus for a passenger engine and get tired of it and put it in freight service.

Mr. Forney thought the subject of brakes had not received from car-builders and the roads generally the attention it was entitled to, and he agreed with Mr. Westinghouse that the art of brake construction as it now existed in car equipment was a disgrace to railroads.

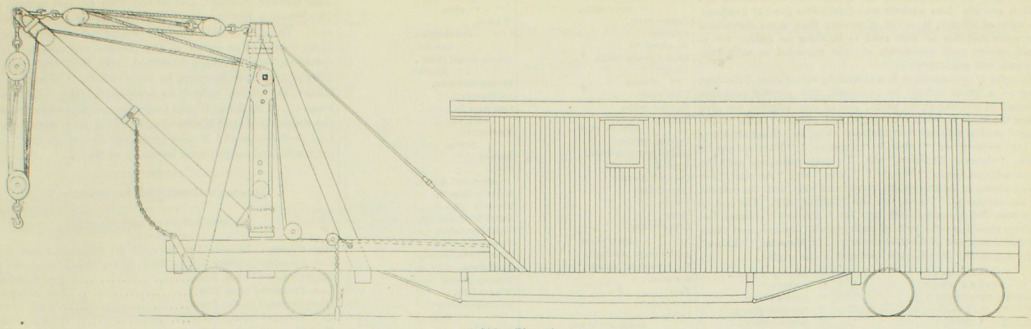
Mr. Fry expressed the opinion that the freight car trucks now in use were behind the age. We should not go on any longer in the old way, each road inventing its own brake and hanging it at so many variable points. In designing a proper freight truck, all should act together and get something more in accordance with existing demands.

Mr. Westinghouse: In making the experiments referred to, we found that the friction was not at all in proportion to the speed. It is a popular belief that if you make an axle a good deal bigger, you will add materially to the friction of hauling the train. I believe if you were to make the axle twice or three times as large you would find it easier to haul with it. But, as I explained, the short block wore away rapidly when there was a great pressure per square inch. With a larger block we got good results, and it did not wear so rapidly. If you make the brass large enough, and the axle large enough, I do not see why you can not get almost as good results as you do from your stationary engines. You have some engines, I have no doubt, that have not been out of their bearings for 20 years. You can not keep the oil between the axle and the brass when you get beyond a certain pressure per square inch. I think, with a little experimenting, you can get an axle that will run with half the oil and with less friction. It is a common thing in England, under a passenger car, to run wheels 4 feet in diameter. On the Great Northern Railway you find them almost as large as our driving wheels. A broader wheel base is, I think, another advantage. I think you now have an opportunity and an excuse for getting a truck that will not only be a good thing in itself, but a proper thing to apply a good brake to. Nearly all of you have noticed that when a brake is applied the truck kicks up at the rear end. That can very easily be explained. The brake is suspended from the top of the truck three feet from the rail, the retardation taking place at the point of contact between the wheel and the rail. Say there are 5,000 pounds on the wheel, there is a retarding effect of 1,000 pounds at that point or 2,000 on the pair of wheels. With a very short wheel base the tipping action is a great deal more than on a long wheel base. That tipping action throws a great deal of the weight on the front wheel, so that it is invariably the hind wheel that slides. If you could get the point of suspension exactly down to a level with the rail there would be no effect of that kind. In applying the brake on the outside of the wheel this thing is greatly aggravated. There is not only the tipping action due to the retardation, but the tipping action caused by the lifting of the block against the truck and the other end pulling down. You see they go at an angle of 20 degrees sometimes.

Mr. Goodwin: I would like to ask if you have made any experiments with short and long wheel bases, to see the difference in friction between the brake and rail on curves.

Mr. Westinghouse: We did not experiment on curves. We had a little van of, I think, 20 feet wheel base, and the way we made a great many of our experiments was to slip the car from the engine and then the brakes would be applied automatically, and the result was registered automatically. We had a French engineer with us, and he said that it would tip over. The action was illustrated in a forcible manner. That thing tipped up. Then I put in an apparatus for weighing the loads on the respective wheels, and the increase of load on the front pair of wheels was more than 3,000 pounds. Of course that was taken off the rear just by quick stopping. To carry out my experiments and get the best results, I had to reduce the leverage at one end of the car to about the proper proportion. Otherwise the hind wheel would always slide, and the front wheel would do the braking. In experimenting, if we accidentally get pressure enough to cause the wheels to slide almost instantly, the impression received at first was that the brake had given out. On one occasion we had such a high pressure that the wheels, in about three seconds, I think, began

WRECKING CAR—LOUISVILLE & NASHVILLE RAILROAD.



Side Elevation.

sliding, and although the engine was some distance ahead, we nearly ran into it. So there is every reason to avoid sliding the wheel on the rail, and that is explained by the fact that the friction at high speed is a great deal less than at low speed. Ordinarily, when a wheel rolls on a rail, the wheel is at rest at the point of contact, and the co-efficient is down as low as 4 or 5 per cent.; but slide the wheels, and it goes up to 30 or 40 per cent. I have experimented with an apparatus which would automatically regulate the force against the block in proportion to the work the block was doing. In other words, it is like an ordinary friction brake in testing an engine. It worked admirably if I fitted it just to one carriage, and had every thing just right and knew exactly what the load was. So we decided on trying it for 20 per cent. retardation. As the block began to hold a little more than 20 per cent., we would open an escape valve and let the air out of the cylinder. But in practice I did not find it of any great advantage on trains. We had to put it at about 17 per cent. in practice, and the result was, that in dry weather we could do better work without it. It prevented sliding the wheel altogether. There is an enormous variation in the coefficient of friction due to the slightest perceptible change in the atmosphere.

The President: The tendency appears to be to increase the tonnage per car. In some instances it has been increased to 25 tons with the present sized axle. It appears to me that if a change is made at all, it should be made to the extent possible with the present bridges and rails—perhaps beyond that. This change should be made at once so that we shall not have to make it five or six times before we arrive at what we want. In order to do that, I think the subject should receive the attention of the best talent in the country; that consultations should be had and experiments made which would prove beyond a question that the best device has been selected to do the work required. I think any hasty action, or any change, upon one road even, would be very detrimental in the end.

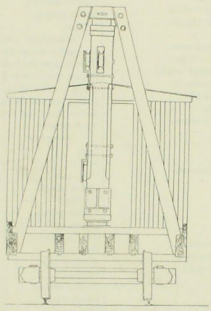
Mr. Westinghouse: I think you could get anybody, almost, to design a standard truck. Any draftsman could go around and collect information from the various car-builders, and you could soon arrive at what is needed.

This concluded the discussion on the subject of brakes. After some further conversation in regard to the difficulties in the way of designing a standard truck that would satisfy all the roads, a vote of thanks was given to Mr. Westinghouse for the information imparted by him to the club, and the meeting adjourned.

What Happens When Cars Turn Over.

It is the general impression that the Miller coupling will uncouple when cars go off the track and are overturned. That this impression is a mistaken one is proved by a recent accident to a passenger train consisting of an engine, two baggage cars, a smoking car, two coaches and a sleeper. The train was running at about 25 miles an hour on a level track, the embankment of which was about 8 feet above the natural surface of the ground. The engineer noticed that the train suddenly pulled hard, and on looking back saw that the wheels of the forward truck of the smoker were running on the ties. The car immediately headed for the edge of the embankment, taking the two baggage cars along with it, all three of them going over and remaining uncoupled when they reached the bottom of the declivity. The rear cars fell over on their sides, the two coaches and sleeper also remaining uncoupled, all of them having the Miller coupling. A number of persons were killed and injured in consequence of the cast-iron seat-ends breaking or pulling loose from the floor, and the seat-backs turning over as the cars fell upon their sides. One passenger was thrown through one of the large windows and killed by the car falling on him. These results indicate that stronger fasteners are needed for seat-ends, and also good strong locks to the seat-back arms, to prevent the backs from reversing when the car is thrown over. The large windows, also, which have been so much in vogue for some time past, should be protected in some way so that passengers will not be thrown through them; and one road, at least, has furnished such protection by placing two brass bars across each of the large windows in its cars.

A TRAIN of 200 empty coal cars, 70 of them being eight-wheel cars, recently passed over the New Jersey Division of the Lehigh Valley road. The train was drawn by one of the new twelve-wheel engines.



Front End Elevation.

SIZES OF TIMBERS.

2 Side sills	6	× 12	in. × 43 ft.	2	in.
4 Center sills	5½	× 11	in. × 41 ft.	6	in.
2 End sills	5½	× 13	in. × 7 ft.	10½	in.
4 Vertical posts for body	4	× 5	in. × 7 ft.	0	in.
14 " " " "	3	× 4	in. × 7 ft.	0	in.
4 " " " "	3½	× 3	in. × 7 ft.	0	in.
12 Braces for body	3	× 3	in. × 8 ft.	0	in.
4 " " "	3	× 3	in. × 7 ft.	6	in.
2 Foot sidings	3½	× 7	in. × 43 ft.	2	in.
1 Cross piece	6	× 9	in. × 9 ft.	0	in.
3 " "	5½	× 3½	in. × 9 ft.	0	in.
1 Back end foot siding	5	×10	in. × 8 ft.	4	in.
2 " " for center plate	4	×16½	in. × 9 ft.	0	in.
1 Mast	14	×13½	in. × 10 ft.	3	in.
2 " braces	9	× 7	in. × 13 ft.	6	in.
2 " "	9½	× 6½	in. × 13 ft.	6	in.
1 Boom	9	×13½	in. × 27 ft.	3	in.
2 Foot boards	4	×12	in. × 8 ft.	4	in.
1 " board	4	×16	in. × 8 ft.	4	in.
2 Pillow blocks	4	× 6	in. × 8 ft.	4	in.
Flooring			2	in. thick.		
Sidings and linings			⅝	in. thick.		
2 Roof plates	5	× 2½	in. × 28 ft.	0	in.
2 Purlins	3	× 1½	in. × 28 ft.	0	in.
9 Carlines for roof	8	× 2½	in. × 9 ft.	0	in.
1 Ridge board	6	× 1½	in. × 28 ft.	0	in.
2 Doors	3½	× 6½	ft. × 1½	in. thick.	
7 Cellar posts	4	× 3	in. × 16 ft.	6	in.
4 " "	4	× 3	in. × 7 ft.	6	in.
2 Facings for cellar	5	× 2½	in. × 16 ft.	6	in.
4 Truck beams	10	×10½	in. × 8 ft.	0	in.
2 Brake beams	4	× 7	in. × 6 ft.	4	in.

1 Snatch block, 3 double blocks, 1 triple block.

The rope, when hoisting, is pulled by an engine.

The Pennsylvania Railroad Report.

The report of the company for 1882 shows the following results:

Earnings of main line and branches between Pittsburg and Philadelphia: Freight, $23,732,588; passengers, mail and express, $6,931,737; rents, $172,637; total, $30,836,962. Expenses of operating, $17,878,777, leaving net earnings $12,958,185, which is an increase of $759,645 over 1881.

Earnings of New Jersey Division and branches: Freight, $7,843,178; passengers, mail and express, $5,834,862; Delaware & Raritan Canal, $553,417; total, $14,231,458. Expenses, $10,169,094, leaving net earnings $4,062,364, which is a decrease of $149,220 as compared with 1881.

Earnings of Philadelphia & Erie Division: Freight, $3,253,473; passengers, mail and express, $757,939; total, $4,011,412. Operating expenses, $2,599,534, leaving net earnings $1,411,878, which is an increase of $387,630 over 1881.

The total net earnings on all lines east of Pittsburg and Erie, after deducting rentals and interest on equipment ($3,472,713), are $14,959,714, which is an increase of $307,613 over those of 1881.

The balance carried to credit of profit and loss, after paying a dividend of 8¼ per cent. (amounting to $6,890,714) was $1,850,560, making the total credit to profit and loss at the close of the year $12,194,639.

The cost of operating the main line and branches between Pittsburg and Philadelphia was 57.98 per cent. of the receipts; the United Railroads of New Jersey, including local and branch lines, and excluding the Delaware & Raritan Canal, 72.19 per cent.; and the Pittsburg & Erie Division 64.80 per cent.

The total freight tonnage moved over main line and branches was 20,360,399; over the New Jersey division, not including canal, 8,241,264; and over the Philadelphia & Erie 5,579,353, being a total increase of 3,233,796 tons over 1881. The number of tons carried one mile on all lines east of Pittsburg and Erie shows an increase of 276,468,675 over 1881. The average freight earnings per ton per mile on these lines were .0874 ct., the average cost .0554 ct., and the average profit .0320 ct., being a decrease of $\frac{3}{10}$ of a mill per ton per mile in net profit.

The number of passengers carried on main line and branches was 10,372,894; on New Jersey division, 10,467,504; and on the Philadelphia & Erie, 1,047,594, being a total increase of 2,902,583 over 1881. The number of passengers carried one mile was 496,202,927, which is an increase of 49,886,372 over 1881. The average earnings from each passenger per mile on all the lines as above were 2.249 cts.; the average cost of transportation 1.663 cts.; and the average net profit per passenger .0586. The average distance traveled per passenger over main line and branches was 23.7 miles. During the year, 1,723,614 pieces of baggage were handled on the three divisions, as against 1,564,858 in 1881, and the amount paid for lost baggage was $1,080.68.

There were built at Altoona during the year, for lines east of Pittsburg, 123 locomotives, 4 dining and 112 passenger cars, 20 baggage and postal cars, 1,940 car-trust cars, 1,210 freight and 62 cabin and way cars, and 853 cars for other lines. At the Philadelphia & Erie shops, 15 locomotives and 313 freight and 6 cabin cars were built. There were also used in construction and repairs on above lines during the year, 33,741 tons of steel and steel rails, and 1,659,584 ties.

The lines west of Pittsburg (controlled by the Pennsylvania Company) show a less favorable result in consequence of low rates and an increase of operating expenses. A dividend of 4 per cent. was paid, however, and a surplus of $1,067,883 carried to credit of profit and loss.

How to Ascertain the Actual Cost of New Locomotive Engines.

It is frequently asserted that railroad companies do not know what is the actual cost of building a locomotive, and for this lack of knowledge various reasons are given, the principal one being that it is impossible to separate the accounts of new work from repair work when both are going on in the shops at the same time. Suppose, for example, that a lathe is running on a piece of work for a new engine, and that it becomes necessary to change the lathe for a pressing repair job. The time occupied in making the change can not properly be charged to the new work, and many master mechanics do not like to have it appear against the repair job, and so it too often happens that this time is not charged to either class of work, although the lathe man must be paid for it out of the company's money. It happens also, not unfrequently, that a cylinder casting, after many dollars worth of work has been expended on it, is found to have a blow-hole in it and is condemned. The new engine evidently can not be charged with this work, but it must be paid for, and whatever is paid for is so much added to the cost of the engine. In the same category may be included "mistakes," which, like the poor, are ever with us. There are also times and occasions when work is suspended a half-day or more on account of funerals of old shop men, or officers connected with the road, and during which the pay of men who work by the month goes on. There is also a certain non-productive element, such as old or infirm men whom the officers or directors find it necessary to take care of, and who are shelved in the locomotive department. The master mechanic does not feel like charging his engine with these items of expense, and he does not do so. There are

also many other expenses of an incidental kind which must be paid out of the fund allowed the locomotive department, and which are run into various accounts under general headings. In view of all this, it is not surprising that when statements are made that this or that road is building an engine for so much money, such statements are not regarded as altogether accurate and conclusive.

In order to call attention to a system by which these difficulties may to a great extent be overcome, and greater precision attained in arriving at the actual cost of new engines, we give below the items in detail as arranged and classified in the "Cost-Sheet" used in a locomotive contract shop, and direct attention to the divisions of "Labor," "Expenses," "Maintenance of Tools, "General Expenses," etc. To save space, we omit the blank columns headed "Weight," "Rate," and "Amount," for the extension of figures on the right-hand side, and the column for the number of "Pieces," on the left-hand side. The cost of each item being carried out into the "Amount" column, the footings show the total cost of each general division, and these are then comprised in the final summary of "Material," "Labor" and "Expenses," showing the total cost of the engine.

MATERIAL.

BOILER SHOP.

Sheets fire box Copper.
" " " Iron.
" " " Steel.
" boiler "
" " Iron.
" " " for liners.
Boiler Rivets.
Copper stay bolts.
Iron " "
" Crown "
Forged stays.
Boiler iron stays.
Angle "
T " "
Pins and washers.
rown bars.
" " ferrules.
Coper boiler tubes.
Iron " "
Copper ferrules for tubes.
Dry pipe.
Water grates.
Richardson Valves and Royalty.
Wood and Coal for flanging.

MACHINE SHOP.

Piston rods (cold rolled).
" " (steel).
Pump " (cold rolled).
" plungers (steel tubes).
Tender truck wheels.
Engine " "
" " axles (steel).
Tender " " "
Driving axles (steel).
Steel tyres.
" crank pins.
" guide bars.
" connecting rods.
Pig lead.

WOOD SHOP.

Ash lumber for house.
Walnut " " "
Poplar " " "
Cherry " " sash.
Ash " " foot board.
" " " steps.
Panel pine for foot board linings.
" " " boiler bands.
" " " lamp shelf.
Boiler and dome lagging.
Cylinder "
Sheet tin for house roof.
Soft solder " " "
Clout nails " " "
Cab door catches.
Cab door fasteners.
Flush bolts.
White door knobs.
Escutcheon plates.
Rubber washers.
Chest locks.
Loose joint wrought butts.
Sash lifts.
Brass hooks and eyes.
Nails.
Channel iron for tender frame.
Yellow pine for tender frame.
Oak for tender frame.
" " " truck.
" " bumpers.
" " brakes.
" " pilot.
Ash " "
" " brakes.
" " front steps.
Yellow pine flooring.
Common " "
Plain iron for "
Moldings for tender.
Nails and spikes for tender.
Brass screws for foot boards.
Blued " " house.
Silver capped screws for house.
Plain " " "
Light glass " " "

TANK, SHEET IRON AND STACK SHOP.

Sheet tank iron.
" " " bumper plates.
Angle iron for tank.
T " " "
Rivets " "
Sheet copper for stack.
MF iron " "
BB " " "
Netting " "
Iron rivets " " "
Copper " " "
MF iron for cleaning pipes.
" dome bases
" wheel covers.
MF iron for tallow pot stand.
" " dashers.
" " corner plates.
" " fire door plates.
" " house corners.
" " cylinder backs.
" " ash pan.
Angle " "
Rivets for "
BB iron for hose clamps.
Cleaned iron for cyl. casing.
" " st. c. "
Cleaned iron for dome casing.
" " sand box "
Sheet brass for "
" " cylinder "
" " st. c. "
" " dome "
" " foot board nosing
" " lamp shelf "
" " check covers.
" " flow bowl.
" " boiler ring.
Brass half tubes for nosing.
Tank iron for apron.
Galv. " strainers.
Copper for "
" " sleeve.
Iron pipe for wheel covers.
Brass " "
" rivets "
Iron " "

ERECTING SHOP.

Steam gauge.
Brass steam gauge pipe.
No. injector and fixtures,
Iron feed pipe.
" hand rail pipe.
" sand pipe.
" drip "
" blower pipe.
" oil "
" cyl. cock pipe.
" sand box "
" "
" "
" "
" "
Malleable pipe fitting.
Copper pump feed pipe.
" injector "
" " check pipe.
" pump "
" sand pipe.
" drip "
" blower "
" oil "
" steam gauge pipe.
" "
" "
" "
Brass hand rail pipe.
" cab handle "
" flag holder "
" oil "
" water gauge"
" "
" "
" "
Russia iron jacket.
Planished iron jacket.
Brass boiler bands.
Iron " "
" jacket screws.
Brass " "
" " rivets.
Iron " "
Clout nails.
Rubber blocks.
" springs.
2½" Tank hose.
1¾" " "
1" Ash pan "

PAINT SHOP.

White lead.
Filling.
Priming.
Green.
Metallic brown.
Baldwin "
Dead English vermilion.
Varnish " "
Chinese vermilion.
Vienna lake.
Dead lamp black.
Varnish " "
Drop black.
Putty.
Black drying japan.
Furniture varnish.
Body "
Shellac "
Gold leaf.

IRON FOUNDRY.

All castings in rough.

BOLT SHOP.

Frame bolts.
Cylinder "
St. chest "
Engine truck bolts.
Tender " "
" frame "
Pilot bolts.
Bumper bolts.
Sundry "

SPRING SHOP.

Driving springs.
Engine truck springs.
Tender " "
Counterbalance "
Coil reverse "
Volute "
Piston "
Brake beam "

SMITH SHOP.

All forgings in rough.
No. 1 wrought scrap.
Bar iron.
Fuel
Incidentals.
Labor.

BRASS FOUNDRY.

Cylinder covers.
" bushings.
" glands.
" head acorns.
" cock handle.
Piston rings.
" bolts and nuts
" follower nuts.
Steam chest cover beads.
" bushings.
" glands.
Drivi g brasses.
Engine truck brasses.
Tender " "
Conn. rod " "
Pump barrels.
" top chambers.
" bottom "
" flanges.
" glands.
" cages.
" checks.
" " nuts.
" " acorns.
" delivery pipe.
" swivels.
" rings.
" feed valve.
Injector check.
" " coupling.
" feed valve.
" steam "
" tee
Feed cocks.
Tank "
Gauge cocks.
Cylinder "
Drip "
Blow off "
Mud drum cocks.
Surface "
Pet "
Waist "
Blower "
Stop "
Heater "
Water column.
" gauge.
Drip funnel.
Safety valves.
Pet "
Blower "
Heater "
House oil valves.
Surface "
Relief "
Steam chest oil cups.
Guide "
Rocker "
Stub "
Tallow pot stand.
Boiler plugs.
Corner "
Fusible "
Water grate plugs.
" " ferrules.
Throttle handle.
" wheel.
" jaw and latch.
" stuffing box.
" bushings.
Hose screw.
" nuts.
" swivels.
Dome beads.
" acorns.
Sand box beads.
" rod handle.
" acorns.
Jacket clips.
Hand rail columns.
" flanges.
" acorns.
House handle knobs.
Flag fixtures.
Bell.
" yoke.
" column.
" acorn.
Bell crank.
" rope thimble.
" " eyes.
Whistle.
" rod thimble.
" " handle.
Steam gauge stand.
" " handle.
Spring balances.
Cab lamp.
Cab door fixtures.
" lamp stand.
Heater tee.
" fitting.
Blower "
Oil "
" pipes and valves.
Reverse handle.
Pet cock "
Relief lever handle.
Cross-head gibs.
Monogram rings.
Wheel-cover acorns.
Head-light "
Number plates.
Side badges.
Steam-pipe rings.
" " nuts.
Smoke-box "
Gongs.
Patent plates.
Thumb screws.
Name plates.
Unions.

FURNITURE AND FIXTURES.

Poplar for house boxes.
Butt Hinges for house boxes.
Poplar for tank boxes.
Strap hinges for tank boxes.
Hasps for tank boxes.
Screw jacks and levers.
Steel chisels.
" wrenches.
Iron "
Screw "
Cab lamp.
Quart oilers.
Oil cans.
Tallow pots.
Cushions.
Ash-pan hose.
Bell cord.
Whistle cord.
Padlocks.
Piston lifters.
Pinch bar.
Fire tools.

LABOR.

Boiler shop.
Tank and sheet-iron shop.
Cab and tender shop.
Machine "
Wheel and tyre "
Vise shop.
Erecting shop.
Paint shop.
Engineers time trying.
Hauling and handling material.
Foremen and clerks' time.
Pro. of Draftsmen.
" time of watchmen.
" " sweepers, janitors, etc.

EXPENSES.

Stationary engines.
Pro. of time of engineers.
" " firemen.
" coal and wood.
" oil and waste.
" repairs, labor.
" " material.

MAINTENANCE OF TOOLS.

Pro. of emery, emery paper, sand paper, sal soda, borax, brooms, soap, scrub brushes, paint brushes, varnish brushes, sash tools, drills, hand screws, hammers, hammer handles, screw wrenches, files, file handles, emery wheels, grindstones, vises, hyd. jacks and repairs of same, belting, oil and waste.
Pro. of reps. to heating furnaces.
" " steam hammers.
" " machine tools and shafting.

SUNDRY EXPENSES.

Pro. of gas light.
" stationery and printing.
Spoiled work, labor.
" " material.

GENERAL EXPENSES.

Pro. for taxes on property.
" insurance of "
" repairs of "
" insurance of boilers (sta).
" traveling expenses.
" water rents.
" telegrams and postage.
" photographs.
" plumbing and gas-fitting.
" delivery of engines.
" advertising.
" fuel for stoves.

SUMMARY.

Material
Labor.
Expenses.

THE MOSHER JACK PATENT DECISION.—In December, 1880, Jacob O. Joyce, of Dayton, brought suit in the United States Circuit Court against the Chillicothe Foundry & Machine Works Company and F. M. DeWeese, claiming that the pawl as used in the Mosher jack was an infringement on his patent. The case was argued before Justice Mathews, of the United States Supreme Court, in June last at Cleveland, and on the 13th of last month, at Cincinnati, a decision was rendered in favor of the defendants. The court holds that the Joyce patent on lifting-jacks is limited in scope to the precise construction and combination of devices described, and that the Mosher lifting-jack, manufactured by the defendants, does not infringe the Joyce patent so construed. The Chillicothe Foundry & Machine Works Company were contractors for the finishing of the Mosher jacks. This is a very important decision, as the Mosher jacks are in use on about 200 railroads, and largely used by many of them.

Dunbar's Compound Locomotive.

(*See illustrations on opposite page.*)

DIMENSIONS.

High Pressure Cylinder, 1 in thick, 12 in. diameter, faced 32 in.
Low Pressure Cylinder, 1⅛ in. thick, 20 in. diam., faced 36½ in.
High Pressure Piston Rod.....2¼ in. diameter.
Low Pressure Piston Rod.....3 in. diameter.
High Pressure Steam Ports.....1¼ × 8 in.
Low Pressure Steam Ports.....1¼ × 12 in
High Pressure Exhaust Port.....2½ × 8 in.
Low Pressure Exhaust Port.....2½ × 12 in.
Center to Center of H. P. Cylinders.....81¼ in.
Center of L. P. Exhaust Port to Center of H. P. Exhaust Port, 12½ in.
Center of L. P. Cylinder to Front Faced Joint of H. P. Cylinder, 55⅝ in.
Inside Length of Steam Chest.....31 in.
Inside Width of Steam Chest.....22 in.
Diameter of Main Valve Stem.....1¾ in.

The engravings illustrate the Dunbar arrangement of high and low pressure compound cylinders for locomotives. The application of this arrangement to the ordinary type of American 8-wheel engines requires no change in their construction other than the coupling of the main rod to the outer journal of the forward crank pin, instead of coupling it next to the wheel. This is necessary to allow the high pressure cylinders to clear the forward truck wheel. The low pressure cylinders occupy the position of the cylinders on ordinary engines, the high pressure ones being bolted by their back heads to the front heads of the low pressure, in tandem style. The arrangement of the main valves is especially well designed so as to allow of access, facing, etc.

In Fig. 1, the low pressure valve, having a passage *J* over the exhaust cavity, is coupled to the same stem as the high pressure cylinder valve directly in front of it, both valves being of the same dimensions as to lap, etc., so that the point of cut-off will be the same in both cylinders—the ordinary shifting-link being used. Both valves, it will be noticed, are seated on the low pressure cylinder. The forward and smallest valve, Fig. 1, controls the high pressure cylinder, the steam ports of which, Fig. 2, run out to the front end of the low pressure cylinder, where they are connected by the pipes *P P*, Fig. 6, to the ports of the high pressure cylinder *Q Q*, Fig. 2, which run to each end of that cylinder, as shown by the dotted lines. The exhaust port of the high pressure valve leads to a port *N*, Fig. 2, in the same chest as per dotted lines, which port is in line with two others, *M* and *K*. These three ports are covered by a valve *L*, Figs. 3 and 4, which valve is controlled by a lever from the cab.

When the engine is working compounded, the exhaust steam from the high pressure cylinder returns in the usual way through the steam port under the high pressure valve into the exhaust cavity which leads to the port *N*, Fig. 2, through this port and under the valve *L*, Figs. 3 and 4, into the port *K*, Figs. 3 and 2. The port *K* has a second opening *K*, Fig. 2, close to the low pressure valve seat, the cavity *J* of which covers it as shown in Fig. 4. The exhaust steam from the high pressure cylinder thus finds its way into the cavity *J* of the low pressure valve, and is distributed to the low pressure cylinder the same as by an ordinary slide valve, and from this cylinder it is exhausted into the atmosphere.

The steam from the boiler enters the chest on the low pressure cylinder the same as on an ordinary cylinder, and is prevented from access to the low pressure cylinder by its valve, which covers the port *K* next to its seat at all times. When it is desired to use both cylinders on a side for high pressure, the valve *L*, Fig. 3, is pushed to the right, uncovering the port *K*, Figs. 3 and 2, and admitting the steam from the chest, which then passes down through *K* and into the cavity *J*, Fig. 4, in the valve. The exhaust from the high pressure cylinder then passes out of the port *N*, Fig. 3, and down the port *M* into the exhaust port of the low pressure cylinder, which is then common to both cylinders. The joint on the piston-rod between the two cylinders is composed of metallic (Babbitt) rings cut to break joints, and follows up the wear by means of two coil springs.

Mr. Dunbar says: "By working the high pressure cylinder full stroke, and exhausting into the low pressure cylinder, it would work three volumes, and I hope to do the same work as a 16-inch cylinder, full stroke, exhausting into the atmosphere; and by carrying 160 pounds of steam by the gauge, to do as much with a 12-inch cylinder as we now do with an 18-inch one carrying 130 pounds per gauge. When compounded, I expect to work from three to five volumes, according to train and grades, and save from 15 to 25 per cent. I should prefer to work the low pressure cylinder full stroke, and cut-off in the high pressure cylinder, but the extra amount of gearing would not compensate for the advantage, and, in fact, it is not essential in my arrangement, as it is with Webb's and Mallett's."

The arrangement of Mr. Dunbar is, in our judgment, deserving of high commendation. It is original and mechanically well planned and comprises as few parts as possible. Its practical working will soon be tested upon one of the standard 8-wheel engines of the Boston & Albany road, to which it is now being applied by Mr. A. R. Underhill, the Superintendent of Motive Power, whose adoption of a high boiler pressure has already been productive of the most economical results. This test of the first American compound locomotive will undoubtedly attract considerable attention among railroad men.

CYLINDERS, STEAM CHEST AND VALVES OF H. D. DUNBAR'S COMPOUND LOCOMOTIVE

Now being built by A. B. Underhill, Master Mechanic of the Boston & Albany Railroad.

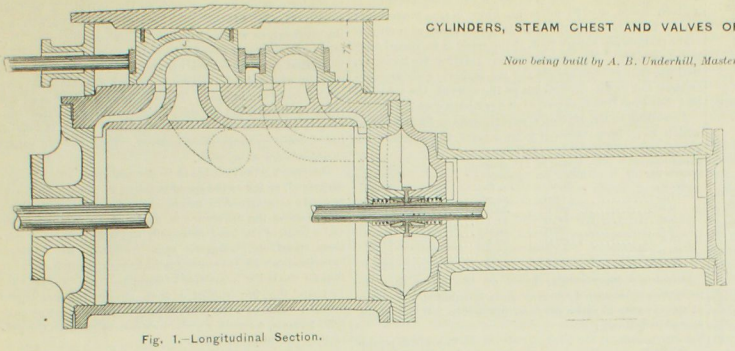


Fig. 1.—Longitudinal Section.

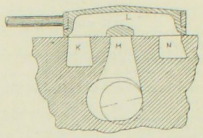


Fig. 3.—Section on line A B, Fig. 2.

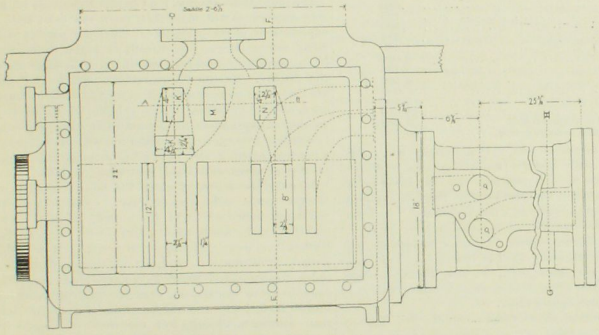


Fig. 2.—Plan of Ports and Steam Chest.

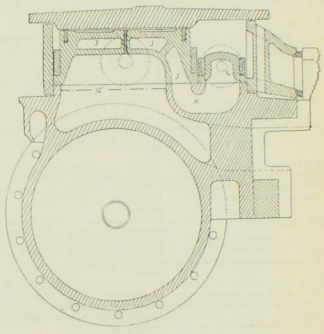


Fig. 4.—Section on line C D, Fig. 2

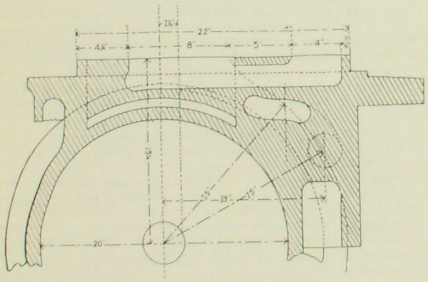


Fig. 5.—Section on line E F, Fig. 2

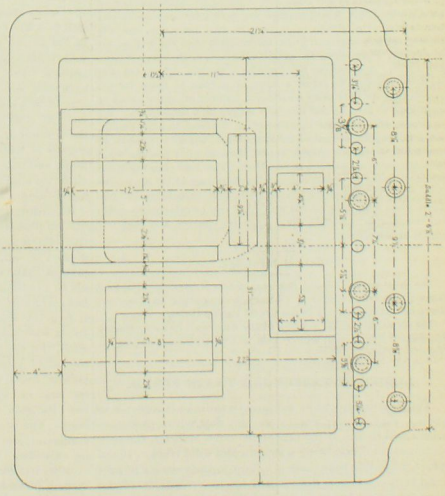


Fig. 7.—Plan of Valve Faces at Seat.

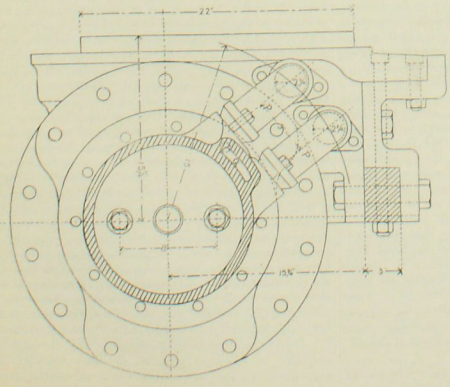


Fig. 6.—Section on line G H, Fig. 2

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Addresses.—*Business letters should be addressed, and drafts and money orders made payable, to* THE NATIONAL CAR-BUILDER. *Communications for the attention of the Editor should be addressed* EDITOR NATIONAL CAR-BUILDER.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notice of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR-BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of the month.*

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ROBERT CLARKE & CO., 65 *West Fourth Street, Cincinnati, Ohio.*

Back Numbers.

We are constantly receiving letters asking for single numbers of the CAR-BUILDER. These requests are mostly for some particular number issued a month, or a year, or two years ago, and containing some special matter or information that the writers are in need of. Some write for sample numbers, or for the last number issued. Applications like these have become so frequent that we are compelled to refuse a large proportion of them, for the reason that we only print a sufficient number of extra copies of each issue to keep up our files and supply new subscribers. We can meet this irregular and scattering demand, to some extent, when the papers are called for at the office, but as a rule we can not in future take the trouble to mail them and pay postage when only ten cents is remitted in payment. The best plan for those who only want an occasional number is to pay $1.00 for twelve consecutive numbers from year to year, and keep them on file. Then when a back number is wanted, it can be referred to without the trouble of writing for it when the chances are that our supply is exhausted.

Annual Meetings.

The seventeenth annual meeting of the Master Car-Builders' Association will be held in Chicago, commencing on Tuesday, June 12. Headquarters at the Grand Pacific Hotel.

The sixteenth annual meeting of the American Railway Master Mechanics' Association will be held in Chicago, commencing on Tuesday, June 19.

LIMITS OF PASSENGER TRAIN SPEED.

The superintendent of a Southern railroad is reported as saying that he expects to see the day when passenger trains will be run at the rate of 100 miles an hour, the only essential condition being a smooth and solid track. It appears, however, that there is a limit to the velocity of railroad trains, which is determined by the resistance of the atmosphere, and it has been said that this limit is 70 miles an hour for average trains. This would seem to be a high figure if any dependence is to be placed upon data which have hitherto been regarded as conclusive. A college professor of natural philosophy who had been making some investigations relative to the speed of ice boats, informed us recently that he had found the common belief that the pressure of the wind against a surface perpendicular to its course varies as the square of its velocity, to be erroneous at high speeds. That is to say, if the wind pressure at a given speed, say 20 miles an hour, is two pounds per square foot, the pressure will be four times as much, or eight pounds per square foot, if the speed is increased to 40 miles an hour. The investigations referred to, however, indicate that at high speeds the atmospheric resistance increases, not as the square, but as the cube of the velocity, and that even this is exceeded at very high speeds.

According to Dr. Hutton's experiments in England, and which have been believed to be correct, the relation between force and speed is as follows:

Pressure in pounds per sq. ft.	Speed in miles per hour.	Pressure in pounds per sq. ft.	Speed in miles per hour.
1.3	18.0	31.25	88.0
2.6	25.6	36.5	95.2
5.2	36.0	41.7	101.6
10.4	50.0	46.9	108.0
15.6	62.0	52.1	113.6
20.8	76.0	57.3	119.2
26.0	80.4	62.5	124.0

Smeaton's experiments, based on the belief that the pressure per square foot in pounds is equal to the square of the velocity in miles per hour divided by 200, are represented as follows:

Velocity in miles per hour	Pressure in pounds per sq. ft.
1	.005
2	.020
3	.045
4	.080
5	.125
10	.500
12½	.781
15	1.125
20	2.000
25	3.125
30	4.500
40	8.000
50	12.500
60	18.000
80	Violent storm, hurricane 32 000
100	Hurricane uprooting trees 50.000

These tables, as will be seen, vary materially, which indicates that but little positive knowledge can be derived from them on the point in question. The Tay River bridge disaster demonstrated that the leading English engineers know little about the facts of wind resistance. In Liverpool, a wind with a velocity of 38 miles an hour produced a pressure of 14 lbs. per square foot on a surface perpendicular to its course, and a wind of 70 miles an hour gave 42 lbs. pressure per square foot. As these are actual facts, they show that the effect in these cases was nearly twice as great as Smeaton's figures show.

The experiments of Mr. O. Chanute on the Erie Railway show that the forward car of a passenger train may be assumed to present an end area of 90 square feet, and that each of the other cars of the train presents an additional surface of 40 per cent. of the 90, or 36 square feet, the forward car receiving the resistance squarely, and the others being protected by the cars in front of them to the extent of 60 per cent. To this may be added the front of the engine and cab, which may be estimated at 90 feet more. Assuming these several areas of resistance to be correct, a train of 10 cars, with the engine, would present a total resistance of 504 square feet. Now, if the gale of wind in Liverpool, moving at 70 miles an hour, gave a pressure of 42 pounds per square foot, it follows that a train of cars running at 70 miles an hour in a calm, would encounter the same atmospheric resistance that it would if standing still in a wind blowing at the same rate, and which would be 504 square feet of area multiplied by 42 pounds per foot, making a total train resistance from the air of 21,168 pounds. The tractive force of an engine with 20×26 cylinders and 6-foot drivers, assuming an effective pressure of 90 pounds per square inch, which is high, we would have $20^2 \times 90 \times 26 \div 72 = 13{,}000$ pounds, which, aside from the friction of engine and train, demonstrates that such an engine is wofully deficient in power to meet the conditions, and that 70 miles per hour with 10 cars will require either an engine of much greater capacity, or a corresponding reduction of atmospheric resistance.

Regarding the problem of high speed from an economical standpoint, the first thing in order would seem to be the reduction of air resistance. This, if it can be accomplished at all, must be brought about by a change in the present shape of cars. It is said that the resistance of the air to a cylindrical body is about one half what it is to a flat surface of the same dimensions; that is, if a cylinder 1 foot in diameter and 3 feet long, and a flat board 1 foot wide and 3 feet long, be exposed to the same wind, the cylinder will receive only half the pressure that the board receives. Mr. Scott Russell, the English shipbuilder, found that in changing a 50 horse-power engine for one of 75 horse-power, in a boat with a bluff bow, the gain in speed was only a quarter of a knot an hour. The speed of steamboats was at that time 8 or 9 miles an hour, and it was not believed that this could be exceeded. By changing the shape of the hulls, however, in accordance with the wave-line theory, Mr. Russell made it possible to attain a speed of 15 miles an hour. Notwithstanding the difference in the densities of water and air, it is clear that the laws which govern the shape of boats in order to obtain a minimum of resistance, apply more or less to moving or stationary structures in the matter of atmospheric resistance.

These considerations would seem to suggest the expediency of a change in the form of cars and engines in order to overcome, to some extent at least, one of the obstacles to high speed. If the fronts of engines and cabs were made to conform as far as practicable to the principles of boat construction, and if the space between the engine cab and the first car, as well as between the other cars, were covered or shut in by canvas held in place by a light framework that could be folded up and removed when not in use, the atmospheric resistance would doubtless be very considerably diminished. The window openings, also, not being flush with the car side, intercept the air in fast running to an extent which is only apparent when the number of these openings is considered. This obstacle might easily be done away with.

The practical advantage to be derived from the changes suggested, so far as the speed problem is concerned, could be easily ascertained by means of the dynamometer, which would show the difference in draft of an ordinary train and a train of the kind proposed, the atmospheric conditions, speed, etc., being the same for both. Mr. Dudley's experiments with this instrument have already somewhat shaken the belief in accepted formulas, from the fact that he found that the draft of a train at starting was 12,000 pounds, while at a speed of 50 miles per hour it was only 3,000 pounds, a result which does not tally with the previously prevailing theories.

THE CHICAGO EXPOSITION.

The indications are that the Chicago Exposition of Railway Appliances will more than meet the most sanguine expectations of its projectors. There is a general movement among all who are directly or indirectly interested in railways, to contribute something to the magnitude of the display. Manufacturers, railway officers and others are becoming more impressed every day with its importance, and are preparing to send exhibits which involve an amount of expenditure far beyond what was contemplated a month or two ago. The exposition will undoubtedly be a marked event, a sort of semi-centennial mile-stone in railway progress, and from now until its close, Chicago will be the Mecca toward which the faces of railway men of every grade, and the great army of workers in a host of collateral industries, will be turned, to say nothing of the vast multitude which will be attracted thither from mere curiosity or diversion. How could it, indeed, be otherwise? A great continent, with 110,000 miles of railway and 20,000 locomotives, and these barely equal to the demands of an ever growing traffic, with unlimited facilities for the transportation of material, and all roads leading to Chicago like the paths of eastern commerce to Venice of old, it would surely be a reproach to American enterprise if the exposition should be anything less than a magnificent success. Our home resources are by no means scanty; and these are being reinforced by foreign contributions to an extent that was hardly anticipated at the outset. The public spirit and enlightened liberality of the business men of Chicago is a sufficient guarantee that nothing will be left undone on their part to enhance the interest of the occasion. The work which the Executive Committee have in hand is no bagatelle, and is likely to become more formidable as the opening day approaches; but the ability and business experience of the gentlemen who compose it are equal to the emergency.

The exhibition will present a comprehensive view of the best results thus far attained in railway practice, in this country at least, and these will be contrasted with the antiquated relics of earlier appliances, and also with many examples of the intermediate stages of progress. This can not be otherwise than instructive in the highest degree to railway men, and especially so the members of the Master Mechanics' and Car-Builders' Associations, whose annual meetings will be held in Chicago in June. These meetings are usually limited to a three days' session, which is altogether too short a time for the proper transaction of the usual business before them. If the meetings of both associations could be continued this year for three weeks instead of three days, it would be a decided advantage to both. It would be better, as it seems to us, if the usual proceedings and discussions were deferred this year altogether, in order to allow the members to improve an opportunity they never have had before, and which some of them may never have again. It is absurd to suppose that any master mechanic or car-builder can make such a study of the exhibits as every railroad man should make, within the brief period of three or four days or a week, saying nothing of entertainments and other diversions which will claim his attention. The beneficial effect of the exhibition, if it is to be anything more than a mere show, will mainly consist in breaking up old ruts and grooves, unsettling individual ideas and prejudices and removing a great deal of accumulated rust caused by routine and narrow observation. Much of this has been accomplished within the last ten years by the associations above named, but these organizations have got into ruts and grooves themselves, so much so, in fact, that the Car-Builders' Association have had to reorganize and take a new start. A very considerable accession to its membership is looked for at the Chicago meeting, and so far as this increase shall consist of representative members, it is to be hoped that railway managers will see the importance of selecting men of the best capacity and experience so far as relates to a practical knowledge of car construction and management. One feature of the exhibition is the practical tests

which are to be made of material and appliances, and the record which is to be made of the results. Every railway mechanic is interested in this matter. Such tests are good so far as they go, but they are not precisely the kind which the Master Car-Builders' Association is in need of in order to determine the construction of a standard freight truck, the kind of framing that is the best for the bodies of freight box cars, or other features of construction where specific standards are needed.

In view of the fact that the coming exhibition is to be on a scale of such magnitude, and considering also the immense preparation, the vast expenditure of money, and the further fact that it is the first display of the kind of a national, and in some degree international character, it would seem that the time between its opening and closing is quite too short, and that it might be extended to a longer period with advantage to all concerned. Chicago, to be sure, is not an inviting place in midsummer, but there are, nevertheless, vast numbers of railway employés and others who may not find it convenient to visit the exposition in June, but who could and would do so in July, or even in August, rather than not visit it at all.

FREIGHT CARS AND HEAVY LOCOMOTIVES.

A prominent railroad superintendent recently made the prediction that in ten years from now heavy locomotives of the mogul and consolidation types would be used only on very hilly roads. He had for some time kept a careful account of the cost of repairs to freight cars that were properly chargeable to this class of engines, as well as extra repairs to tracks, and accidents from spread rails caused by the excessive weight, and found that it exceeded the saving in trainmen's wages and the interest on the cost of the extra number of lighter 8-wheeled engines necessary to do the same work, to an extent that he was really afraid to mention. The heavy engines pulled out, in freight work, three draw-bars where the lighter engines pulled out one; and the floor framing of cars hauled exclusively by the former was racked and loosened more in a single year than it would be in five years with the latter. With the lighter engines 30 cars were a load, while with the heavy ones 60 cars were now considered about the thing. This superintendent also asserted that if there is an average of 8 inches slack between the draw-heads in a train of 60 cars, a consolidation engine, or "hog," as it is called out West, will, in starting the train, travel 40 feet before the last or rear car moves, the engine, of course, acquiring a headway in the mean time of from two to three miles an hour; the result being that the rear car, weighing, with its load, say 32 tons, is jerked from a dead standstill to a speed at which the engine is moving. If such speed is at the rate of three miles an hour, the effect of the sudden jerk upon the car can be easily imagined. "The floor framing of freight cars," he continued, "has not been increased in strength and in the size of timbers in proportion to the increase in the power of the engines by which they are hauled, and the result is that the cars are racked to pieces in a year." "You can not," he further said, "stall one of our big 'hogs.' When the reverse lever is thrown ahead after taking the slack, and the 'hog' starts, there is no stopping her (him?) with cars. The only limit is the strength of the couplings, and away back in the train somewhere, especially if it is a long one, a coupling breaks, the engine, like a genuine hog, biting off, as it were, the forward portion and moving on."

SCREW-THREADS, NUTS AND BOLTS.

It is doubtful whether any standard that is likely to be adopted to facilitate the repairing of interchange cars can be of greater economic value to railway companies than a practical uniform standard of screw-threads, nuts and bolts. That the advantages of such a standard are not yet realized is due to various causes, among which is the unnecessary anxiety of many car-builders as to who shall make the standard taps and dies. It is manifest that a standard once adopted must be adhered to, or it becomes only a nominal standard. If an adopted standard is rigidly adhere to by all car-builders, the competition among the manufacturers of taps and dies will also compel *them* to adhere to the standard or get in bad repute with their customers. The manufacturers have only to order a set of standards from Pratt & Whitney, which are duplicates of those adopted by the Master Car-Builders' Association, and satisfy themselves that they are such by comparing them with the adopted standards. If they can not work to these standards, the first lot of taps they put on the market will be an evidence of the fact. There are in the country a number of concerns, no doubt, who only require a standard to work from to enable them to produce exact duplicates.

A few years ago a well-known road adopted a standard to enable its car shops at different points to make bolts and nuts that would be interchangeable. At the main shops a set of standard taps were made with nuts to fit—one for each size of iron used. Two steel nuts of each size were tapped with the standard taps, and to these nuts were fitted bolts which required the same force for screwing them in that was required for the standard tap and bolt. This force was determined by delicacy of hand, a standard wrench 12 inches long being used. The two nuts and bolts of each size were then sent to the different shops, with gauges for determining the angle of thread. Two of each were sent to divide the wear in making taps. The shops of the road at that time made their own taps, and were instructed that their nuts must screw on to the standard bolts, and *vice versa*, with the same force as above stated. There was a little trouble at first, and several taps were thrown away because the nuts tapped by a new tap were frequently too tight or too loose. When the tap was too large and it became necessary to reduce its size, the drawing of the temper and retempering occasionally resulted in springing the taps. Once a year the two standard nuts and bolts were returned to the main shop for examination, and if found out of size from wear, two more of each size were sent. The standard was therefore the original steel nuts tapped by the original taps, the wear of these latter in tapping standards for the division shops being too slight to be detected after ten years' use.

Instead of each road purchasing a set of standard gauges as is now proposed, a system somewhat similar to the above might be adopted. The Car-Builders' Association, with the original standards in its possession, could easily have taps made to tap steel nuts of the several sizes, one being the smallest allowable, and the other the largest, so the variation in size could be kept within these limits. A dozen nuts of each size could be sent to each road, the wear of which, divided among so many, could not be perceptible in a lifetime, while the cost would not be a twentieth part of the cost of a set of gauges for each road.

Another thing in connection with this subject that is worthy of some attention is the variety of bolt-cutting machines now in use on the different roads. In some the dies revolve, in others the bolt; a majority of them have adjustable dies, and a few have solid dies. The makers of these machines wish to supply the repair dies, and for this reason never send out a hub so the purchaser can cut his own dies. Many roads prefer making their own, and consequently have to make a hub to cut them. Much has been said as to who are to make the taps, and but little or nothing as to who will make the hubs. If the makers of bolt-cutters are to furnish the hubs for cutting the standard thread on the dies of their machines, they will need standards to work from, and as many machines are now in use whose makers are out of the business, the roads will in many cases be compelled to make the hubs. The tap-makers might make them if they were first informed of the peculiarities of the bolt-cutter in which the hubs are to be used.

The adoption of standard sizes for bolts and nuts will be of immense advantage, and when once reduced to practice, the wonder will be that it was so long deferred. There must also be standard sizes of iron. The variety of existing sizes for what is know as "⅞ round," for example, is a source of endless trouble. A bolt made of iron ⅞ under ⅛ may have been a tight fit originally in an oak car timber. When it breaks on a foreign road and an attempt is made to force in a bolt made of iron ⅞ larger than ⅞, it is necessary to use the burning-iron and sledge quite freely, and these are expensive tools to use, if the value of time is of any account.

THE COST OF STOPPING A TRAIN.

This is a problem which may possibly be cleared up one of these days, but just now the outlook in that direction is not promising. The best plan would seem to be, to get a large number of experienced railroad men to guess at it and then average the guesses. This would be an approximation near enough, perhaps, for all practical purposes. Any one who will figure the cost of stopping a passenger train down to the fraction of a cent, and then prove his figuring to be correct, will beat the weather prophets all to pieces. A very little reflection, however, ought to satisfy any rational mind that it is quite impossible to disentangle and separate all the elements of cost that enter into the stopping of any particular train from the various elements of cost involved in the general operations of a road. There is manifestly no dividing line by means of which the former can be eliminated with any degree of precision. The basis upon which to work in order to arrive at an approximate result is more unreliable than that upon which the milage cost of transporting freight is estimated, and apparently of much less importance. It is a problem, as it seems to us, that is more speculative than practical. The making of stops by railroad trains is a necessity, no matter what the cost may be. The cost of the regular stops of passenger trains is probably about as little as it can be with due regard for the interests of the traffic, and if such cost could be ascertained with absolute certainty for each and every train, it would amount to little more than a curious piece of information.

New England Railroad Club.

In response to a call previously made by a committee appointed at an informal meeting held on the 22d of February, about fifty gentlemen connected with railroads and identified with railroad interests, met at the Quincy House, in Boston, on Wednesday evening, March 21, for the purpose of forming an organization similar to that of the Car-Builders' Club in New York.

Among those present were representatives of the Boston & Albany; Fitchburg; Eastern; Boston & Lowell; Maine Central; Boston & Providence; and Boston & Maine roads; also, of several car manufacturing companies, and supply manufacturers and dealers in Boston, New York and elsewhere.

The meeting was called to order by Mr. F. D. Adams, of the Boston & Albany road, who stated that the object of the proposed organization was for the discussion of subjects pertaining to railroad operation and management, and also for the mutual and social advantage of its membership, which would embrace any who were connected with railroads, or identified with the business of furnishing supplies for railroad use.

The committee previously appointed on the subject reported a plan of organization which was agreed to. The name of the organization is the "New England Railroad Club."

The following officers of the club were then chosen: F. D. Adams, of the Boston & Albany R. R., President; J. W. Marden, of the Fitchburg R. R., Vice-President; and George E. Pratt, of the Fitchburg R. R., Secretary and Treasurer.

Messrs. J. W. Marden, A. Pillsbury and F. D. Adams were appointed an Executive Committee. The future meetings of the club will be held on the second Wednesday of each month, at 7 o'clock P. M., at such place as may be designated by the Executive Committee.

The desire was expressed by Mr. Adams and Mr. Marden that the name adopted for the club should not convey the idea that its membership was in any respect local or exclusive; and in order to prevent any such impression it was voted that the secretary extend a cordial invitation to members of the Car-Builders' Club in New York to attend and participate in the proceedings of the Boston Club as often as may be convenient. The annual assessment for the support of the club was fixed at $1 for each member, and 44 names were signed to the roll of membership.

Car-Builders' Meeting at Buffalo—Standard Links and Pins.

Our March issue contained a hastily written summary of the proceedings of a meeting of Master Car-Builders, held at Buffalo, Feb. 14, and which contained the following statement:

"It was recommended that hereafter no draw-heads be fitted in new cars that will not take the standard link and pin, the link being made of iron of D-shaped section, and measuring 10 × 1¾ in. inside, and the pin 10 in. long and 1⅝ in. in diameter."

Upon referring to a report of the proceedings of the meeting published in a printed circular supposed to be authentic, and from which our summary was made up, we find the following:

Mr. KIRBY moved that the minutes of this meeting be printed for general distribution; carried.

Mr. L. GAREY submitted that a large number of cars are now in service which would not take the standard link and pin. A general discussion on the subject of draw-heads, links and pins followed, and it was stated by the representatives of the following roads they were using links of sufficient size to take the large pin: Grank Trunk; New York, Lake Erie & Western; Lake Shore & Michigan Southern; Cleveland, Columbus, Cincinnati & Indianapolis; Michigan Central; Canada Southern, and the New York Central & Hudson River. The Grand Trunk and the New York Central & Hudson River use an oval pin, the others 1½ in. pins with round D link, as adopted at Buffalo, Jan. 13, 1881.

Mr. G. S. GATCHELL moved to recommend hereafter that no draw-heads be fitted in new cars or repairs which will not take the standard link and pin. Carried.

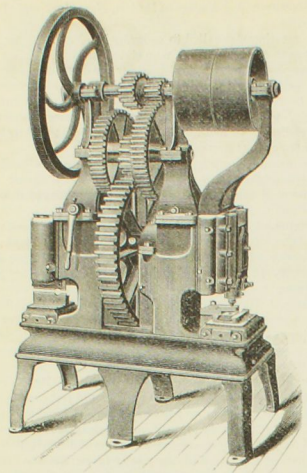
[Then follows a note at the foot, stating that the measurement inside of the link shall be 10 by 1¾ in. wide, section of iron forming the link shall be what is known as D shape, measuring 1¾ in. vertical section and 1½ in. horizontal section; and that the body of pin shall be made 1⅝ in. diameter and 10 in. long from under the collar or shoulder to the point.]

Mr. J. D. MCILWAIN moved that the recommendation adopted in reference to standard draw-heads be presented to the Executive Committee of the Master Car-Builders' Association; carried.

In our summary we should have said that the standard link and pin referred to by Mr. Garey and by Mr. Gatchell, are not standards that have been adopted by the Master Car-Builders' Association, but only recommended by a meeting of the Master Car-Builders of the New York Central and connecting lines, held at Buffalo, Jan. 13, 1881. There was no action taken at the recent meeting in Buffalo in reference to length of link or size of pin, that matter having been settled, presumably, and so far as the roads represented were concerned, at the meeting in 1881. But it *was* recommended that no draw-heads be fitted in new cars or in cars repaired, which would not take the standard link and pin—meaning the Buffalo standard of 1881. The motion of Mr. Gatchell had reference only to the size of openings in draw-heads, many of such openings being too small to admit the extreme width of the Buffalo standard link, which is 4¼ inches, while in other cases the link openings and the pin-holes in draw-heads are too small for a 1⅝-inch pin.

As our brief notice of the meeting seems to have caused some misapprehension, we trust we have now made the matter clear. The trouble is caused by using the term "*the* standard" without defining its limitation to the particular roads represented at the meetings referred to.

THE rolling stock equipment, now partially completed, of the New York, West Shore & Buffalo road, comprises 175 locomotives of uniform patterns and interchangeable parts. The freight engines will be capable of hauling 70 cars of 20 tons capacity. The passenger coaches are being constructed by the Pullman Company from special designs, introducing new methods of lighting and heating, and calculated to afford superior comfort, safety and convenience. The freight cars are uniformly 34 feet in length and designed to carry loads of 25 tons or more.



Colton's Improved Power-Punch and Shears.

THIS machine is as perfect in its design and construction as any machine of the kind can be in respect to strength, compactness, durability, and convenience of operation. It occupies a floor space of 3x5 ft., and weighs, when set up and ready for belt, 6500 pounds. The pulleys are 18 in. in diameter and 8 in. face; revolutions of upper shaft 225 per minute; strokes per minute, slow speed 11, fast speed 22. The main shaft is of the best quality of steel, and the material in the bed and body of the machine is so disposed as to obtain the greatest strength with as little surplus weight as possible. It has a capacity for punching a 1⅞-in. hole through ⅝-in. iron, and shears 1x6 in. iron, and 1⅜ in. round iron, at any desired angle. It is also well adapted to boiler work, and will punch flanged heads from 16 in. diameter upwards, and of any thickness. The machine is geared so that each end works independently of the other, and can be operated at one and the same time without inconvenience to the operators. It is represented in the engraving as arranged for boiler-head punching. Among the prominent shops and firms using it are the Union Iron and Steel Co., Chicago; the Atchison, Topeka & Santa Fe R. R. shops, at Topeka, Kan.; St. Chalres (Mo.) Car Co., Brownell & Wright Car Co., and Haydock Bros., St. Louis, Mo. Manufactured by G. D. Colton & Co., Galesburg, Ill.

Executive Committee of the Master Car-Builders' Association.

LEANDER GAREY, New York Central & Hudson River R. R., Grand Central Depot, New York, N. Y.

M. P. FORD, Pittsburg, Cincinnati & St. Louis R. R., Columbus, Ohio.

WM. MCWOOD, Grand Trunk Railway, Montreal, Canada.

JOHN W. CLOUD, Pennsylvania R. R., Altoona, Pa.

B. K. VERBRYCK, Chicago, Rock Island & Pacific R. R., Chicago, Ill.

WM. FORSYTH, Chicago, Burlington & Quincy R. R., Aurora, Ill.

W. T. HILDRUP, Harrisburg Car Co., Harrisburg, Pa.

JOHN W. MARDEN, Fitchburg R. R., Charlestown, Mass.

W. J. CHRISTOPHER, Central R.R. of N. Jersey, Elizabeth, N. J.

L. PACKARD, Baltimore & Ohio R. R., Baltimore, Md.

JOHN S. LENTZ, Lehigh Valley R. R., Mauch Chunk, Pa.

Dead Weight in Passenger Cars.

A correspondent of the *Railroad Gazette* makes the following comparative statement of the average weight, size and capacity of standard passenger cars built by two roads (names not given) the point of comparison being the dead weight per passenger:

The cars of one road are 57 ft. long and 9 ft. 3 in. wide over sills, seat 76 persons each, and weigh 42,149 lbs., or an average of 554 lbs. to each person. Those of the other road are 55 ft. 6 in. long and 9 ft. 3 in. wide over sills, seat 63 persons each, and weigh 51,545 lbs., or an average of 818 lbs. to each person.

All the cars have 4-wheel trucks and 33-inch steel tired wheels and are of the same width. Assuming the weight of the trucks to be the same for all, there appears to be the surprising difference of 9,396 lbs. in the weights of the respective car bodies, the shorter ones being that much heavier than the longer ones; and, furthermore, the 57-foot car has a seating capacity for 13 persons more than the 55½-foot car, which would indicate 12¼ inches between seats in the longer car and 38 inches in the shorter one, making due allowance for the space occupied by saloon and heater in each. It is evident from these particulars that one or the other of these roads is all wrong in the design and construction of its "standard" cars, or that one of them is putting in too much dead weight and the other not enough. To ascertain just where the line should be drawn between the extremes is a point which can not be definitely determined by a mere statement of comparative dimensions, capacity and weight. Full, detailed specifications of both styles of cars would throw some light on the problem, but this would not be conclusive. There are many other things to be taken into account which we need not enumerate, but which will occur to every one who is familiar with car construction and management.

Rocks, Minerals and Stocks: By Frederick H. Smith, Consulting Engineer and Geologist.—This little volume contains in compact form a great deal of valuable information upon the subjects indicated in its title. The style is remarkably clear and lucid, no scientific or technical terms being used without a full explanation of their meaning. It is a work well adapted to popular appreciation, and meets the existing demand for a better knowledge of facts in reference to precious stones, minerals and mining in a way that will make it an indispensable hand-book for non-experts in the mysteries of mining stock speculation. Published by the *Railway Review*, Chicago. Price in cloth binding $1.50, paper binding 75 cts.

American Sports.—This is the name of a new weekly paper just started in Chicago in the interests of reputable sports and pastimes. It is well printed, and contains a large quantity of reading matter of special interest to professional and amateur sportsmen of every class. Published by the American Sports Co., 204 Dearborn Street, Chicago. T. L. Cowles, Editor.

The Engineering News Quarterly is the name of a new quarterly publication the first number of which will be issued some time during the present month by the Engineering News Publishing Co., of New York, who are the proprietors of *Engineering News and American Contract Journal*. The object of the new enterprise is to render accessible to the engineering profession a mass of information contained in American and foreign periodicals that can not be reproduced within the limits of a weekly journal. The quarterly will be uniform in size with the *Engineering News*, and contain 96 pages, one-fourth of the space to be devoted to illustrations. Price $4 per annum, or $1.25 per number.

A Thrilling Incident.

A mule stood on a railroad track,
Behind him stood the cart:
The driver yelled, his whip he cracked,
But could not make him start.
The flagman called: "Move on, my lad,
The train is almost due!"
The youth, dismounting, said: "Bedad,
I'll leave him, then, to you."
The flagman urged the mule to go,
But all of no avail,
Though blows fell thick as winter snow
And danced like summer hail.
The train came rumbling full in view—
A crowd enjoyed the sport;
Though flagman groaned and engine blew,
The mule still held the fort.
But suddenly there came a crash—
The mule, oh, where was he?
Ask some one who likes hotel hash—
I did not stay to see.

—*Puck.*

Gold Paint.

It is now about fifteen years since gold paint was put on the market. It grew out of a necessity for some cheaper substance than gold leaf, which was not readily adapted to many classes of work, and where available was not easily employed except by skillful experts. The preparation of a bronze powder and varnish, both in this country and Europe, called "gold paint," has attained great popularity. It is durable and at the same time can be easily applied. That these preparations are largely employed on such work as frescoing, furniture and other classes of decorative work, is a sufficient indication of their merit. But it is not only in the various branches of art that they have gained such great favor. The convenient manner in which they are put up, and the low price at which they are offered, places them within the reach of any one who has a desire to try his hand at decoration. As they can be used on paper, wood, stone, iron, plaster of Paris and innumerable other substances, they are adapted to all kinds of decorative purposes. A common plaster cast coated with gold paint is made to look like its metal original, and, unless very closely inspected, a fine cast neatly covered with the paint can hardly be distinguished from the real bronze. We have been shown samples of work on ordinary plaster images that had been exposed to all conditions of sun and atmosphere for over a year, that retained their original brilliancy unimpaired in the slightest degree. The ordinary observer would not know, unless told, that they were imitations of metal. Mirror and picture frames that have become tarnished and defaced by age, discolored household ornaments and various little nick-nacks may be made to take on their original brilliancy again with a coat of this gold paint at a trifling cost. The advantages to be derived from the introduction of this paint are innumerable and cannot be overestimated.—*Painters' Magazine.*

A Test of the Strength of American Cars.

Mr. Alfred Pell, an English gentleman who has recently been traveling in this country, describes a railway accident which happened to the train he was on as follows:

"Now let me tell you of the most remarkable railway accident man ever looked at. I haven't seen anything about it in the papers. We left St. Louis at 7 o'clock last Saturday evening (Jan. 20) by the Vandalia line. At 4 o'clock the next morning, when we were twenty miles west of Indianapolis, I was awakened in my Pullman car by a great knocking and bumping, and in a few moments the car came to a standstill. When I got out I beheld this: The engine was 200 yards ahead by itself, the tender being off the rails. At the place the track is on an embankment eight or ten feet high, and there is a vacant space of land between the bottom of the line and the fence. The ground was covered with long grass, snow and ice. The whole train was spread out back of the engine, the cars retaining their relative positions, but the line extending down the bank and along the bottom in a curved line like a snake. The two mail cars were on their sides and without wheels; the express cars and two freights (baggage) had no wheels, but stood on their bottoms. A passenger car came next; some of its wheels were gone, one end was on the line and the other at the bottom of the bank. The Pullman I was in had just left the rails, as had another, and two that followed it were on the track. The mail bags had caught fire and were burning, but were afterward saved. Now for the strangest feature—not a single person was hurt. The ground was so hard that the wheels ran on it until they were torn off, and then the cars began to slide, and went down like boys a-coasting. The cause of the accident was a sharp frost, which had broken the steel rail as sharply as a piece of glass."

THE PHOSPHOR-BRONZE S^G BEARING METAL, manufactured by the Phosphor-Bronze Smelting Co., Limited, of Philadelphia, Pa., is becoming widely appreciated for its superior qualities as a bearing, and is extensively used upon cars and locomotives and a great variety of miscellaneous machinery. In its application to slide-valves, crosshead gibs, piston rings, bushings and steam connections, its advantages are so apparent that it has been adopted by many of the leading railroads of the country. It has great durability, friction is reduced to a minimum, and when a bearing becomes heated from over-pressure or want of lubrication, it will not cut the journal. The composition of the metal is uniform, the cost is but little more than that of ordinary gun metal or brass, and it is much cheaper in the long run. It is furnished to consumers either in ingots or castings, the loss in remelting the ingot is much less than with brass, and instructions for handling the alloy are given with the first order, so that any competent founder can make good work. The company also manufacture Phosphor-Bronze Telephone Wire, which resists corrosion, has a high tensile strength, is of small size and light weight, will not kink when unwound from the reel, and has a resistance one half that of iron of the same weight.

Our Directory.

We note the following changes since our last issue:

Buffalo, New York & Philadelphia.—A. Vandivort has been appointed Superintendent of the River Division, and E. H. Witter Superintendent of the Pittsburg Division.

Camden & Atlantic.—Mr. J. T. Bannard has been appointed Superintendent, in place of Mr. F. A. Lister, who has gone to the Mexican National road.

Cleveland, Tuscarawas Valley & Wheeling.—The name of this road has been changed to Cleveland, Lorain & Wheeling.

East Tennessee, Virginia & Georgia.—Mr. Wm. A. Harrison has been appointed Purchasing Agent, with office at Knoxville, Tennessee.

Lake Shore & Michigan Southern.—A. G. Amsden, late Superintendent of Kalamazoo Division, has been transferred to the Western Division, and M. E. Wattles succeeds him on Kalamazoo Division.

Natchez, Jackson & Columbus.—Col. E. D. Frost has been appointed General Superintendent.

New York, Lake Erie & Western.—R. B. Cable has resigned as Superintendent of the Susquehanna Division, to accept a position on the Denver & Rio Grande.

New York, West Shore & Buffalo.—Harry Linn, late Asst. Supt. of Motive Power, has been appointed Master Mechanic.

Northern Pacific.—H. W. Fairweather has resigned as Superintendent of the Pend D'Oreille Division, and F. F. Griffin has been appointed in his place. G. W. Cross, Supt. of Trans. of Eastern Divisions, has resigned, and J. T. Odell, late Supt. of Dakota Division, has been appointed to succeed him.

Old Colony.—J. R. Kendrick has been appointed General Manager. He has been Superintendent of the road for many years.

Union Pacific.—A number of corrections in the official list, as published in our last issue, have been made, for which, see Directory.

Wisconsin Central.—W. A. Short, late of Canada Southern, has been appointed Master Mechanic, vice J. B. Heuney resigned.

Employment.

Advertisements will be inserted under this heading for one dollar for each insertion.

WANTED.—To act as Agents in Chicago for the sale of Railway Appliances of known merit. Have office and sample-room in Grand Pacific Hotel, and travelers constantly on the roads. Am personally acquainted with a large number of Master Car-Builders and Master Mechanics. Will also exhibit at Chicago Exposition of Railway Appliances. Address "Lenox," office of NATIONAL CAR-BUILDER.

WANTED.—Every Manufacturer of Railroad Material who is desirous of reaching Mexican and South American trade, to send for a copy of the NATIONAL CAR-BUILDER Supplement for 1883, Export Edition.

WANTED.—By a first-class mechanical draughtsman (age 27) who is thoroughly familiar with all kinds of car work, a permanent position either in office or in superintending car construction. Railroad company's office preferred. Best of references can be furnished. Address "Gondola," office of NATIONAL CAR-BUILDER. 2t.

WANTED.—In the Blacksmith Department of a Railway Repair Shop, a quick and active man of strict sobriety as Foreman. Must be a first class mechanic, understand working steel, also steam and trip-hammer, the use of cast-iron formers, etc. Must come well recommended from parties where last employed. Address "W," office of NATIONAL CAR-BUILDER.

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By permission, we refer to the following Companies, for whom we have made Special Colors:

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PENNSYLVANIA CO., Wm. Mullins, General Purchasing Agent, Pittsburg, Pa.
BALTIMORE & OHIO RAILROAD CO., N. S. Hill, Purchasing Agent, Baltimore Md.
CHICAGO & ALTON RAILROAD CO., A. V. Hartwell, Purchasing Agent, Chicago, Ill.
CHICAGO & NORTHWESTERN RAILROAD CO., R. W. Hamer, Purchasing Agent, Chicago, Ill.
LEHIGH VALLEY RAILROAD CO., L. Chamberlin, Purchasing Agent, Philadelphia, Pa.
NORTHERN RAILROAD OF CANADA, F. W. Cumberland, Superintendent, Toronto, Ont.
NAUGATUCK RAILROAD CO., G. W. Beach, Superintendent, Waterbury, Conn.
PHILADELPHIA, WILMINGTON & BALTIMORE RAILROAD CO., S. A. Hodgman, Superintendent of Motive Power, Wilmington, Del.
NEW YORK, NEW HAVEN & HARTFORD RAILROAD CO., R. N. Dowd, Commissary, New Haven, Conn.
UNION PACIFIC RAILROAD CO., A. D. Clark, Purchasing Agent, Omaha, Neb.
KANSAS [illegible] CO.,
CHICAGO, BURLINGTON & QUINCY RAILROAD CO., Wm. Irving, Purchasing Agent Chicago, Ill.
LOUISVILLE, CINCINNATI & LEXINGTON RAILROAD CO., Wm. Mahl, Purchasing Agent, Louisville, Ky
GRAND TRUNK RAILWAY, N. Wall, Port Huron, Mich.
LITTLE ROCK & FORT SMITH RAILROAD CO., T. Hartman, Purchasing Agent, Little Rock, Ark.
GILBERT & BUSH CO., Troy, N. Y.
WASON MANUFACTURING CO., Brightwood, Mass.
BILLMEYER & SMALL MANUFACTURING CO., York, Pa. } Railroad Car Builders.
JACKSON & SHARP CO., Wilminton, Del.
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The advantages derived from the use of such Special Colors are many, a few of which are found below:
ABSOLUTE UNIFORMITY OF SHADE. DURABILITY, as we use perfectly pure materials. **SAVING OF MONEY,** because of small quantity required. **SAVING OF TIME,** in the putting on of the same. **SAVING OF LABOR AND MATERIAL,** as no extra amount of Varnish will be required to hide a sanded surface. **LARGER DEGREE OF CERTAINTY** that there will be an absence of cracked work, as our mixtures are all uniform, being done by weight only.
We make any desired shade, it only being necessary that purchasers furnish us with sample of color desired, stating the time they would like to have the paint dry in.
We shall be glad to furnish samples and give prices to any who may wish to avail themselves of the above advantages.
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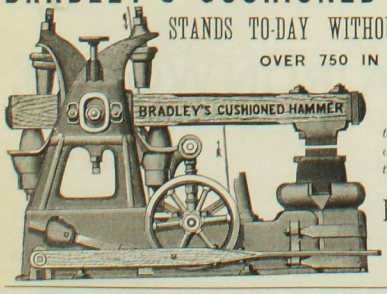

It approaches nearer the action of the Smith's arm than any hammer in the world.

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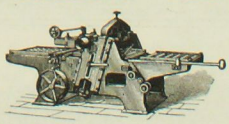

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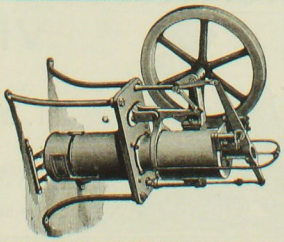

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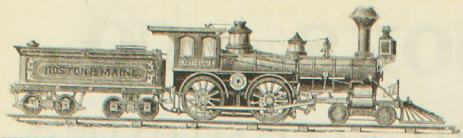

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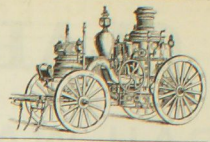

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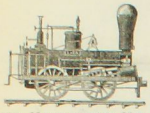

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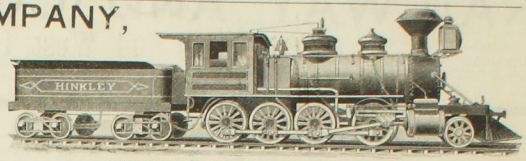

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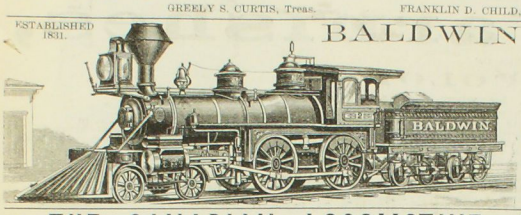

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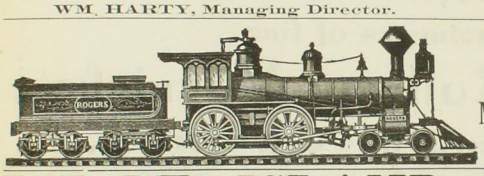

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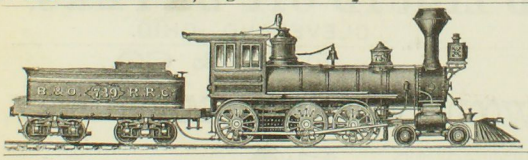

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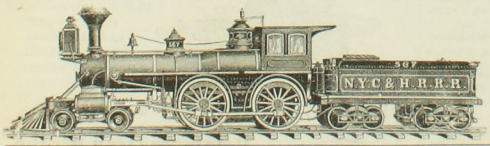

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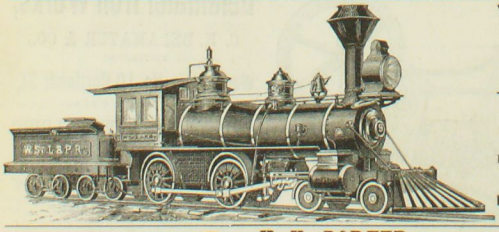

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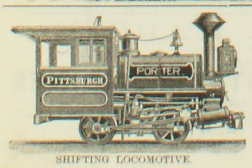

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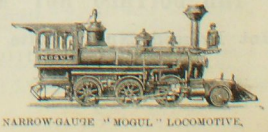

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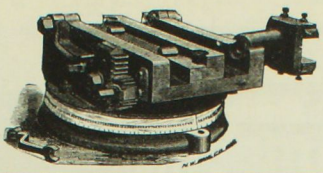

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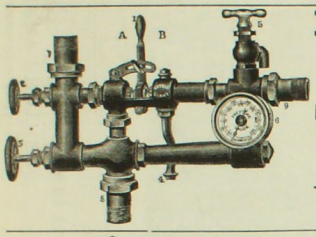

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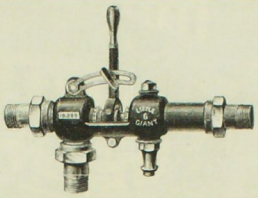

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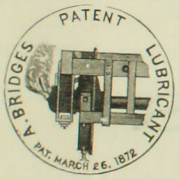

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For Locomotive Jackets and other Fine Work.

We sell the GENUINE imported article, which long experience has proved to be the most durable polished iron ever manufactured. It will not contract rust by mere exposure to the atmosphere.

Tin and Roofing Plates especially adapted for Railroad Car Roofs. Pig Tin, Zinc, Solder, Lead, Etc.

Nos. 213 and 215 WATER STREET, NEW YORK.

ANSONIA BRASS AND COPPER CO.,

MANUFACTURERS OF

ANSONIA REFINED INGOT COPPER.

ANCHOR & STAR BRANDS.

SHEETS, BOLTS, RODS, WIRE, Etc.

W. E. DODGE, Jr., Pres.
G. P. COWLES, Vice-Pres. & Treas.
A. A. COWLES, Sec'y.

BRASS AND COPPER

PURE COPPER WIRE

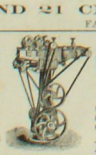
FOR ELECTRICAL PURPOSES, BARE AND COVERED.

SEAMLESS BRASS & COPPER TUBING.

19 AND 21 CLIFF STREET, NEW YORK.

FACTORIES AT ANSONIA, CONN.

BLIND SHADE Planing Machine FOR CAR WORK.

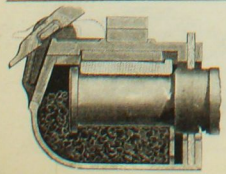


The most perfect Machine in use.

LEE'S PATENT Molding Machines.

Five different styles and sizes. These are especially adapted to all classes of car work.

HENRY A. LEE, Manuf'r, 164 Union St., Worcester Mass.



THE HEWITT BOX-LID CO.,

142 DEARBORN ST.,

CHICAGO, ILL.

We respectfully refer you to the following railroads using the Hewitt Cover.

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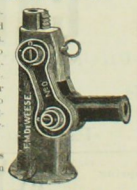
THE MOSHER LIFTING JACK.



Made of the best air-furnace malleable iron, and on scientific principles. Are used by about two hundred railroad companies. Seven sizes, ranging in capacity from four to twenty tons, suited to every department of railroad use and fully guaranteed.

Price-list and discounts furnished on application to manufacturer.

F. M. DEWEESE, Chillicothe, O.

THIS HAMMER

AWARDED THE FIRST PREMIUM OF A SILVER MEDAL AT THE American Institute Fair, N. Y. CITY, NOV., 1873.

Superior in every point to any modification of the Trip Hammer. Simple, Powerful, Efficient and Cheap. Four sizes now being built. For Prices and Descriptive Circulars, address the manufacturers,

S. C. FORSAITH & CO., Manchester, N. H.

who are also builders of the Abbe Bolt-Heading Machine.

W. D. WOOD & CO.'S

PATENT PLANISHED SHEET IRON.

Patented March 14, 1865; April 8, 1873; Sept. 9, 1873; Oct. 6, 1874; Jan. 11, 1876.

Guaranteed fully equal, in all respects, to the

IMPORTED RUSSIA IRON,

And at a much less price.

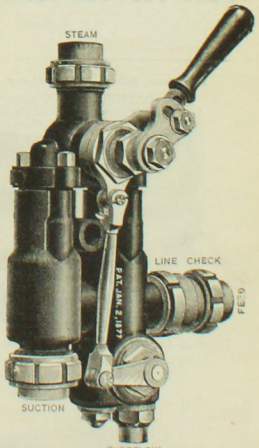
LOCOMOTIVE JACKET IRON

Our Specialty.

For sale by all the principal Metal Dealers in the large cities throughout the United States, and at their office,

111 Water Street, Pittsburgh, Pa.

THE IMPROVED HANCOCK INSPIRATOR FOR LOCOMOTIVES.



Send for Circulars and Full Particulars to

THE HANCOCK INSPIRATOR CO.

34 BEACH STREET,

Boston, Mass.

HOWARD IRON WORKS,

BUFFALO, N. Y.,

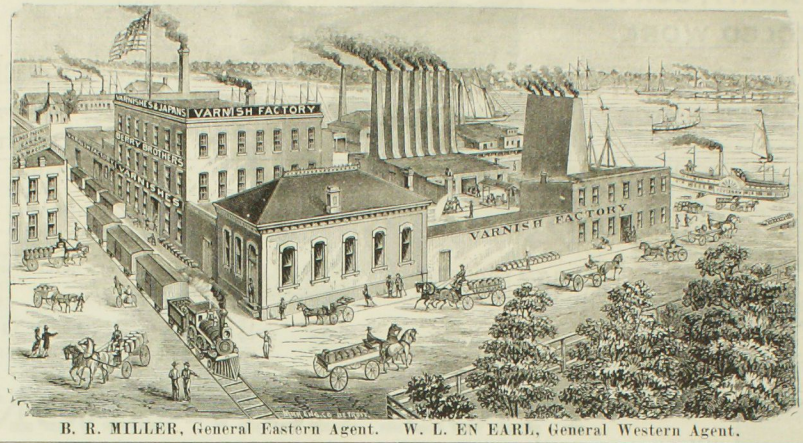
MANUFACTURERS OF

Schlenker's Automatic Revolving Die Bolt Cutter and Nut Tapping Machine.

SPECIALLY ADAPTED FOR RAILROAD USES

BERRY BROTHERS, DETROIT, MICH., MANUFACTURERS OF RAILWAY VARNISHES.

ESTABLISHED IN 1858. USE BERRY BROTHERS' RAILWAY VARNISHES.



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THE E. D. ALBRO COMPANY,

DIRECT IMPORTERS OF

MAHOGANY

(Via New Orleans),

MANUFACTURED TO SIZES SPECIALLY ADAPTED FOR

CAR-BUILDERS.

MANUFACTURERS OF

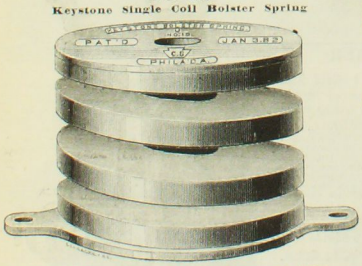
VENEERS, CAR-BUILDERS' MATERIAL

FROM DOMESTIC AND FOREIGN WOODS.

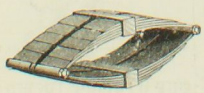
685--711 West 6th St., **CINCINNATI, O.**

Estimates and Price Lists Furnished.

NO. 19.
Keystone Single Coil Bolster Spring



Patented Aug. 16th, 1881, and January 3d, 1882.
Capacity, 35,000 Pounds Each.
Motion Very Soft and Slow.



KEYSTONE CAR SPRING WORKS.

CHARLES SCOTT,

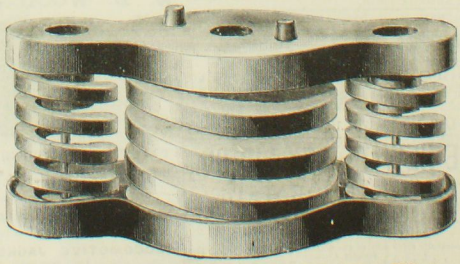
C. T. SCHOEN, Supt. MANUFACTURER OF

RAILWAY CAR SPRINGS,

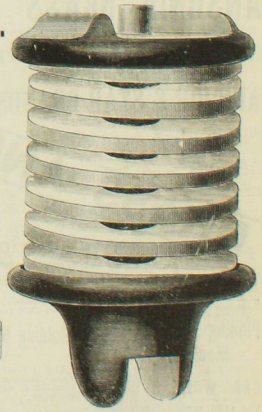
1,028 to 1,038 New Market Street,

PHILADELPHIA, PA.

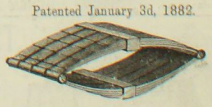
KEYSTONE GRADUATED BOLSTER SPRING.
NO. 17.



Capacity 40,000 Pounds Each—Motion Softer than Ellipties.
Patented August 16th, 1881 January 3d and March 21st 1882.



Patented January 3d, 1882.



DIRECTORY

of the Railroads of the United States and Canada, showing the gauge, length of road, number of locomotives and number of cars; and giving the names and titles of their principal officers in charge of the operating, purchasing and rolling stock departments.

A

Adirondack R. R. 4-8½ gauge 60 m. 3 lo. 62 cars)
C. E. Durkee, *Supt.* ..... Saratoga, N. Y.
Jacob Myers, *M. M.* ..... Saratoga, N. Y.
Jas. J. Traver, *M. C. S.* ..... Saratoga, N. Y.
Alabama Great So'n R. R. (*See Cin., N. O. & T. P.*
Albany & Susquehanna R. R. (*See D. & H. Canal Co.*)
Albert Ry. 4-8½ g. 51 m. 3 lo. 32 cars.
G. A. Robinson, *Manager.* ..... Hillsboro, N. B.
Jas. McKay, *M. M. & C. S.* ..... Hillsboro, N. B.
Allegany Central R. R. 3 gauge 30 miles.
Geo. D. Chapman, *Gen. Man.* ..... Angelica, N. Y.
W. O. Chapman, *Gen. Supt.* ..... Friendship, N. Y.
Allegheny Valley R. R. 5-0 g. 250 m. 70 lo. 2200 c.
Dav'd McCargo, *Gen. Supt. & Pur. Agt.*; and
C. B. Price, *Supt.* (Riv. Div.) ..... Pittsburg, Pa.
A. Jackson, *Supt.* (L'd. Div.) ..... Reynoldsville, Pa.
Geo. W. Glass, *M. M.* ..... Verona, Pa.
R. Gunning, *M. C. S.* ..... Verona, Pa.
Annapolis & Elk Ridge R. R. 4-8½ g. 20 m. 4 lo. 29 c.
W. H. Bians, *Supt. & Pur. Agt.* ..... Annapolis, Md.
John L. Beall, *M. Mach.* ..... Annapolis, Md.
Arkansas Midland R. R. 3-0 g. 48 m. 3 lo. 20 cars.
A. H. Johnson, *Pr. & Gen. Man.* ..... Helena, Ark.
J. B. Johnson, *M. M. & M. C. B.* ..... Helena, Ark.
Ashland Coal & Iron Ry. 4-8½ g. 30 m. 2 lo. 425 c
Douglas Putnam, Jr., *Gen. Supt.* ..... Ashland, Ky.
Robt. Peebles, *Pur. Agt.* ..... Ashland, Ky.
E. M. Roberts, *M. M.* ..... Ashland, Ky.
Ashtabula & Pittsburgh Ry. (*See Penna. Co.*)
Asheville & Spartanburg R. R. 5-g. 48 m. 2 lo. 12 c.
Jas. Anderson, *Supt. & Pur. Agt.* ..... Spart'b'g, S.C.
Wm. Platt, *M. M.* ..... Spartanburg, S. C.
W. B. Brown, *M. C. B.* ..... Spartanburg, S. C.
Atchison, Topeka & Santa Fe. R. R.
C. C. Wheeler, *Gen. Man.* ..... Topeka, Kan.
D. J. Chase, *Gen. Supt.* ..... Topeka, Kan.
W. W. Allen, *Asst. Supt.* ..... Topeka, Kan.
F. M. Smith, *Pur. Agt.* ..... Topeka, Kan.
Geo. Hackney, *Supt. Lo. & Car. Dept.* ..... do.
Clem. Hackney, *Asst. Sup. L. & C. Dept.* ..... do.
Eastern Div.: C. M. Babbon, *Supt.* ..... Topeka, Kan.
Henry Hull, *G. F. Car Dept.* ..... Topeka, Kan.
John Fagan, *M. M.* ..... Atchison, Kan.
J. M. Smith, *M. M.* ..... Kansas City, Mo.
Alfred Taylor, *M. M.* ..... Emporia, Kan.
Mid. Div.: H. R. Nickerson, *Supt.* ..... Nickerson, Kan.
W. J. Johnson, *M. M.* ..... Nickerson, Kan.
J. Q. Adams, *M. M.* ..... Dodge, Kan.
Col. Div.: W. W. Borst, *Supt.* ..... La Junta, Col.
A. C. Sides, *M. M.* ..... La Junta, Col.
D. H. Dotterer, *M. M.* ..... Raton, N. M.
Las Vegas D. :Geo. L. Sands, *Supt.* Las Vegas, N.M.
Jas. Waugh, *M. M.* ..... Las Vegas, N.M.
Rio G. Div.: Geo. L. Sands, *Supt.* Las Vegas, N.M.
J. H. Holman, *M. M.* ..... Wallace, N. M.
J. W. Sager, *M. M.* ..... San Marcial, N. M.
H. P. Olcott, *M. M.* ..... Deming, N. M.
Atlanta & West Point R. R. (*See Western of Ala.*)
Atlantic & Pacific R. R. 4-8½ g. 286 m.
F. W. Smith *Gen. Supt.* ..... Albuquerque, N. M.
B. W. Angell, *Div. Supt.* ..... Albuquerque, N. M.
Geo. Chalender, *Supt. M. P. & M.* ..... do.
D. B. Sibley, *Pur. Agt.* ..... Chicago, Ill.
Augusta & Knoxville R. R. 30 miles.
Gen. Supt & M. M. ..... Augusta Ja.

B

Baltimore & Ohio R. R.
4-8½ g. 1,539 m. 546 lo. 14,862 cars.
N. S. Hill, *Pur. Agt.* ..... Baltimore, Md.
E. Ohio R'y Div.
W. M. Clements, *Mast. Trans.* ..... Baltimore, Md.
N. E. Chapman, *Mast. of Mach.* ..... Baltimore, Md.
A. J. Cromwell, *Asst. M. of M.* ..... Baltimore, Md.
L. Packard, *M. C. B.* ..... Baltimore, Md.
I. N. Kalbaugh, *M. M.* ..... Baltimore, Md.
Wm. Edwards, *M. M.* ..... Martinsburgh, W. Va.
Sam. Houston, *M. M.* ..... Piedmont, W. Va.
Robert Maxwell, *M. M.* ..... Cumberland, Md.
S. B. Crawford, *M. M.* ..... Grafton, W. Va.
Alex. Laird, *M. M.* ..... Parkersburg, W. Va.
Chas. Hirsch, *M. M.* ..... Wheeling, W. Va.
Pitts. Div.: T. M. King, *Gen. Supt.* ..... Pittsburg, Pa.
J. E. Sampsell, *Asst. M. of M* Connelsville, Pa.
Trans-Ohio Divs.: B. Dunham, *G. Man.* ..... Newark, O.
W. H. Harrison, *Asst. M. of Mach.* ..... Newark, O.
E. L. Welsgerber, *M. M.* ..... Newark, O.
H. M. Ingler, *M. M.* ..... Bellaire, O.
O. B. Perkins, *M. M.* ..... Zanesville, O.
Andrew Beckert, *M. M.* ..... Sandusky, O.
F. J. Gunther, *M. M.* ..... Chicago Junction, O.
Chi. Div.: John Thomas, *Gen. Supt* ..... Chicago, Ill.
Benj. Lowther, *M. M.* ..... Garrett, Ind.
W. H. Wilkinson, *M. M.* ..... Kingsto, Ill.
Baltimore & Potomac R. R. (*See Penna. R.R.*)
Bangor & Piscataquis R. R. 4-8½ g. 63 m. 4 lo. 87 cars.
Arthur Brown, *Supt.* ..... Bangor, Me.
C. S. Nason, *M. M.* ..... Bangor, Me.
J. W. Comins, *M. C. B.* ..... Oldtown, Me.
Barclay R. R. 4-8½ g. 16 miles.
F. F. Lyon, *Supt.* ..... Barclay, Pa.
J. A. Hardenburg, *Pur. Agt.* ..... 21 Cort. st. N. Y.
Wm. Johnson, *M. M.* ..... Towanda, Pa.
Bedford, Springville, Owensburg & Bloomfield Ry.
3 g. 41 m. 5 lo. 65 cars.
Jas. W. Kennedy, *Gen. Supt. & Pur. Agt.*; and
Capt. Geo. Elliott, *M. M.* ..... Bedford, Ind.
Richard G. Elliott, *M. C. B.* ..... Bedford, Ind.
Bellaire, Zanesville & Cin. Ry Co. 4-8½ g. 42 m. 3 lo. 29 c.
J. Cochran, *Mast. Trans.* ..... Bellaire, O.
Bell's Gap R. R. 3 g. 23 m. 4 lo. 130 cars.
F. C. Ford, *Supt.* ..... Bellwood, P. O. Pa.
D. Zimmerman, *M. C. B.* ..... Bellwood, Pa.
Bennington & Rutland Ry. 4-8½ g. 9 m. 10 lo. 214 c.
F. C. White, *Supt. & Pur. Agt.* ..... Bennington, Vt.
G. W. Blanchard, *M. M.* ..... Rutland, Vt.
Bingham, Canyon & Camp Floyd, and
Wasatch & Jordan Valley R. R.'s.
3 g. 44 m. 7 lo. 300 cars.
J. G. Kennedy, *Gen. Man.* ..... Salt Lake City, Utah
Geo. M. Young, *Supt.* ..... do.
Bodie Lumber Co. 3 g. 34 miles.
Thomas Holt, *Supt. & Pur. Agt.* ..... Bodie, Cal.
E. M. Lockett, *M. M. & C. B.* ..... Bodie, Cal.
Boston, Barre & Gardner 4-8½ g. 30 m. 7 lo. 107 c.
H. M. Witter, *Supt. & Pur. Agt.* ..... Worcester, Mass.
Chas. F. Brigham, *M. M.* ..... Worcester, Mass.
Boston Concord, Montreal & White Mts. R. R.
4-8½ g. 167 m. 34 lo. 977 cars.
James A. Dodge, *Gen. Man.* ..... Plymouth, N. H.
J. Thos. Vose, *Pur. Agt.* ..... Boston, Mass.
R. Adams, *M. M.* ..... Lake Village, N. H.
G. A. Ferguson, *Asst. M. M.* ..... Lake Village, N. H.
L. D. Pickering, *M. C. B.* ..... Lake Village, N. H.
Boston, Hoosac Tunnel & W'n Ry.
4-8½ g. 65 m. 18 lo. 1,658 cars.
H. L. Morrill, *Gen. Man.* ..... Saratoga, N. Y.
C. H. Cory, *Supt.* ..... Mechanicville, N. Y.
J. H. Wilder, *Pur. Agt.* ..... Mechanicville, N. Y.
C. H. Corey, *M. M.* ..... Mechanicville, N. Y.
John S. Ellis, *M. C. B.* ..... Mechanicville, N. Y.
Boston, Revere Beach & Lynn R. R. 4 g. 9 m. 3 lo. 46 c.
L. C. Legro, *M. of Trans.* ..... Boston, Mass.
C. A. Hammond, *Supt. & P. Agt.* ..... Boston, Mass.
J. L. Folsom, *M. M.* ..... Boston, Mass.
John Coghlan, *M. C. B.* ..... Boston, Mass.
Boston & Albany R. R. 4-8½ g. 372 m. 345 lo. 9,111 c.
W. H. Barnes, *Gen. Supt.* ..... Boston, Mass.
E. Gallup, *Asst. Supt.* ..... Springfield, Mass.
A. B. Underhill, *Supt. M. P.* ..... Burlingfield, Mass.
F. D. Adams, *Gen. M. C. B.* ..... Allston, Mass.
H. B. Chesley, *Div. Supt.* ..... Boston, Mass.
G. H. Colby, *Div. M. M.* ..... Boston, Mass.
C. E. Grover, *Div. Supt.* ..... Springfield, Mass.
H. W. Eddy, *Div. M. M.* ..... Springfield, Mass.
J. B. Weston, *For. Car Sh.* ..... Springfield, Mass.
W. H. Russell, *Jr. Div. Supt* E. Albany, N. Y.
T. B. Purvis, *Div. M. M.* ..... East Albany, N. Y.
J. E. Doran, *For. Car Sh.* ..... East Albany, N. Y.
Boston & Lowell R. R.
4-8½ g. 140 m. 73 lo. 1,231 cars.
C. H. Mellen, *Supt.* ..... Boston, Mass.
F. H. Nourse, *Pur. Agt.* ..... Boston, Mass.
J. F. Tucker, *Supt. T. & Mach.* ..... Boston, Mass.
Boston & Maine R. R. 4-8½ g. 206 m. 80 lo. 2,100 c.
J. T. Furber, *Gen. Supt. & P. A.* ..... Boston, Mass.
Geo. J. Fisher, *Pur. Agt.* ..... Boston, Mass.
Wm. Smith, *M. M.* ..... Boston, Mass.
D. C. Richardson, *M. C. B.* ..... Lawrence, Mass.
Boston & Providence R. R. 4-8½ g. 67 m. 52 lo. 1,000 c.
A. A. Folsom, *Gen. Supt.* ..... Boston, Mass.
Geo. Richards, *M. M.* ..... Roxbury, Mass.
Jno. Lightner, *C. S.* ..... Roxbury, Mass.
Bradford, Bordell & Kinzua R. R. 3 g. 30 m. 6 lo. 80 c.
R. G. Taylor, *Gen. Man.* ..... Bradford, Pa.
John Delaney, *M. M. & C. B.* ..... Bradford, Pa.
Bradford, Eldred & Cuba R.R. (*See Tonawanda,etc.*)
Breakwater & Frankford R. R. (*See Junc. & Break.*)
Brighthope R. R. 3 g. 37 m. 3 lo. 105 cars.
Jas. R. Worth, *Supt.* ..... Richmond, Va.
A. Gary, *Supt. Way & Works.* Winterpock, Va.
Alex. Calder, *M. M.* ..... Chester, Va.
Brunswick & Western R. R. 5 g. 172 m. 13 lo. 170 c.
R. B. Meader, *Supt.* ..... Brunswick, Ga.
Buff., N. Y. & Phila. Ry. 4-8½ g. 242 m. 48 lo. 3,560 c.
Geo. S. Gatchell, *Gen. Supt.* ..... Buffalo, N. Y.
W. W. Halsey, *Asst. to G. Supt.* ..... Buffalo, N. Y.
J. H. Poole, *Pur. Agt.* ..... Buffalo, N. Y.
Allen Vail, *Supt. M. P. & M.* ..... Buffalo, N. Y.
Buff. Div.: J. T. Hardiker, *Supt.* ..... Buffalo, N. Y.
Rock. Div.: R. M. Patterson, *Supt.* Rochester, N. Y.
N. G. Div.: J. W. Watson, *Supt.* ..... Olean, N. Y.
Riv. Div.: J. Vandivort, *Supt.* ..... Buffalo, N. Y.
Pitts. Div.: E. H. Witter, *Supt.* ..... Pittsburg, Pa.
Buff., Pittsburg & W'n R. R. 4-8½ g. 156 m. 33 lo. 975 c.
O. Wallace, *Gen. Supt & Pur. Agt.* Buffalo, N. Y.
E. H. Witter, *Asst. Supt.* ..... Oil City, Pa.
H. J. Bookhammer, *M. M.* ..... Oil City, Pa.
John Monks, *M. C. B.* ..... Oil City, Pa.
Burlington, Cedar Rapids & Northern Ry
4-8½ g. 713 m. 73 lo. 2,758 cars.
C. J. Ives, *Gen. Supt.* ..... Cedar Rapids, Ia.
Robt. Williams, *Supt.* ..... Cedar Rapids, Ia.
T. Stickney, *Pur. Agt.* ..... Cedar Rapids, Ia.
R. W. Bushnell, *M. M. & C. B.* Cedar Rapids, Ia.
Burlington & Lamoille R. R. 4-8½ g. 35 m. 4 lo. 64 c.
G. L. Linsley, *Gen. Man. & Supt.* Burlington, Vt.
F. G. Bowers, *M. M. & C. B. & P. Agt.* ..... do.
Burlington & Mo. Riv. R. R. (in Neb.) (*See C. B & Q.*)
Burlington & North-West'n Ry. 3 g. 38 m. 3 lo. 85 c.
Geo. Slason, *Supt.* ..... Burlington, Ia.
Burlington & Ohio River R. R.
Gen. Man. & Pur. Agt. Chicago, Ill.
J. K. Lape, *Supt. of Equip.* ..... Chicago, Ill.

C

California Southern R. R. 4-8½ g. 127 m. 13 lo. 301 c.
J. N. Victor, *Supt.* ..... National City, Cal.
Berkley Powell, *Mech. Supt.* National City, Cal.
Camden & Atlantic R. R. 4-8½ g. 70 m. 16 lo. 394 c.
J. T. Bannard, *Supt & Pur. Agt.* Camden. N. J.
Rufus Hill, *M. M.* ..... Camden, N. J.
Samuel Hilles, *M. C. B.* ..... Camden, N. J.
Canada Southern Ry. 4-8½ g. 403 m. 89 l. 3,307 c.
W. P. Taylor, *Gen. Man.* ..... Buffalo, N. Y.
A. F. Howland, *Pur. Agt.* ..... St. Thomas, Ont.
Rob't Potts, *Gen. M. C. B.* ..... St. Thomas, Ont.
Can. Div.: E. P. Murray, *Supt.* St. Thomas, Ont.
Robert Smith, *M. C. B.* ..... St. Thomas, Ont.
U. S. Div.: E. P. Murray, *Supt.* ..... Detroit, Mich.
O. P. Dunbar, *M. M.* ..... Grosse Isle, Mich.
Canadian Pacific R. R. 4-8½ g. 551 m. 26 lo. 473 c.
W. C. Van Horne, *Gen. Man.* ..... Winnipeg, Man.
Eastern Div. 240 m. 16 lo. 276 cars.
Archer Baker, *Gen. Supt.* ..... Montreal, Can.
Tho. Irwin, *Mech. Supt.* ..... Brockville, Ont.
Western Div. 311 m. 10 lo. 207 cars.
A. B. Stickney, *Gen. Supt.* ..... Winnipeg, Man.
T. W. Shaughnessy, *Pur. Agt.* Winnipeg, Man.
F. C. Butterfield, *M. M. & M. C. B.* Winnipeg Man.
Cape F'r & Yadkin V. R. R. 4-8½ g. 47 m. 4 lo. 31 c.
L. C. Jones, *Gen. Supt.* ..... Fayetteville, N. C.
Isaac Wright, *M. M. & C. B.* Fayetteville, N. C.
Carolina Central R. R. (*See Bal. & Aug.*)
Carson & Colorado R. R. (*See Va. & Truckee.*)
Catasauqua & Fogelsville. 4-8½ g. 25 m. 6 lo. 577 c.
C. W. Chapman, *Supt. & P. A.* Catasauqua, Pa.
J. Thomas, *M. M.* ..... Hokendauqua, Pa.
Chas. Hollbach, *M. C. B.* ..... Catasauqua, Pa.
Central and South-western Railroads (Ga.)
5 g. 975 m. 127 lo. 1,858 cars.
W. G. Raoul, *Pres.* ..... Savannah, Ga.
Wm. Rogers, *Gen. Supt.* ..... Savannah, Ga.
C. H. Carson, *Pur. Agt.* ..... Savannah, Ga.
Cen. Div.: R. D. Arden, *M. M.* ..... Savannah, Ga.
John McCann, *M. M.* ..... Augusta, Ga.
F. Devine, *For. C. Sh.* ..... Savannah, Ga.
So.-West'n Div.: W. F. Shellman, *Supt.* Macon, Ga.
D. M. Gugel, *M. M.* ..... Macon, Ga.
James A. Knight, *M. C. B.* ..... Macon, Ga.
Central R. R. of N. J. 4-8½ g. 544 m. 294 lo. 27,108 c.
W. W. Stearns, *Gen. Supt.* ..... Elizabeth, N. J.
B. W. Burnett, *Pur. Agt.* ..... New York, N. Y.
Cen Div.: W. Woodcock, *M. M* Elizabethport, N. J.
Geo. Hackett, *M. C. B.* ..... Elizabethport, N. J.
C. G. Williams, *M. M.* ..... Jersey City, N. J.
John Kinnaghan, *M. M.* ..... Phillipsburg, N. J.
Long Br. Div.: J. F. Randolph, *Supt.* Long Branch, N. J.
N. J. So. Div.: R. Blodgett, *Supt.* ..... Manchester, N. J.
Wm. Montgomery, *M. M.* ..... Manchester, N. J.
Chas. N. Sawyer, *M. C. B.* ..... Manchester. N. J.
Lehigh & Susquehanna Div.:
W. S. Polhemus, *Supt.* ..... Mauch Chunk, Pa.
L. C. Brastow, *Supt. Mach.* ..... Ashley, Pa.
Central R. R. of S. C. (*See Wil. & Wel.*)
Central Ry. of Ga. 4-8½ g. 354 m. 49 lo. 1,560 cars.
D. N. Pickering, *Gen. Supt.* ..... Marshalltown, Ia.
John Player, *M. M.* ..... Marshalltown, Ia.
T. L. Seevers, *M. M. C. B.* ..... Marshalltown, Ia.
Central Pac. R. R. 4-8½ g. 3,780 m. 299 lo. 7,277 c.
A. N. Towne, *Gen. Man.* ..... San Francisco, Cal.
J. A. Fillmore, *Gen. Sup.* ..... San Francisco, Cal.
R. H. Pratt, *A. G. Supt* ..... San Francisco, Cal.
J. R. Watson, *Gen. Pur. Agt.* Sacramento, Cal.
A. J. Stevens, *Gen. M. M.* ..... Sacramento, Cal.
W. McKenzie, *Asst. G. M. M.* Sacramento, Cal.
Benj. Welch, *Gen. M. C. B.* ..... Sacramento, Cal.
G. J. Forster, *Asst. G. M. C. B.* Sacramento, Cal.
Western: Visalia & Tulare Divs. and Northern Ry.
A. D. Wilder, *Supt.* ..... W. Oakland, Cal.
G. D. Welch, *M. M.* (W. Div.) W. Oakland, Cal.
W. B. Ludlow, *M. C. B.* (W. Div.) do.
S. Johnson, *M. M.* (T. Div.) ..... Tulare, Cal.
D. Rutherford, *M. M.* (N. Div.) N. Vacaville, Cal.
Sacramento; Oregon Divs.; and Cal. Pac. R. R.
J. B. Wright, *Supt.* ..... Sacramento, Cal.
M. W. Conkey, *M. M. (S. Div.* Sacramento, Cal.
Truckee Div.: Frank Free, *Supt.* Wadsworth, Nev.
Geo. Gregg, *M. M.* ..... Wadsworth, Nev.
Wm. Mitchell, *For. Car Sh.* Wadsworth, Nev.
Humb't Div.: G. W. Coddington, *Supt.* Carlin, Nev.
W. F. Smith, *M. M.* ..... Carlin, Nev.
J. C. Hallahan, *For. Car Sh.* ..... Carlin, Nev.
Salt Lake Div.: A. G. Fell, *Supt.* ..... Ogden, Utah.
James Lamb, *M. M.* ..... Terrace, Utah.
A. Pomfourt, *For. Car Sh.* ..... Ogden, Utah.
Los Angeles; and Yuma Divs. (So. Pac.)
E. E. Blake, *Asst. Supt.* ..... Los Angeles, Cal.
James Velsir, *M. M.* ..... Los Angeles, Cal.
T. T. Gilleland, *For Car Sh.* Los Angeles, Cal.
Arizona Div. (So. Pac.):
A. A. Bean, *Asst. Supt.* ..... Tucson, Ariz.
W. F. Smith, *M. M.* ..... Tucson, Ariz.
Rio Grande and El Paso Divs. (So. Pac.):
J. Campbell, *Ass't Supt.* ..... El Paso, Texas.
H. C. Standish, *For. Sh.* ..... El Paso, Texas.
Central Vermont R. R. 4-8½ g. 548 m. 132 lo. 3,525 c.
J. W. Hobart, *Gen. Supt.* ..... St. Albans, Vt.
J. M. Foss, *Asst. Gen. Supt & M. M.* St. Albans, Vt.
No. Div.: J. H. Hoyt, *Supt.* ..... St. Johns'y, P. Q.
Rut. Div.: J. Burdett, *Supt.* ..... Rutland, Vt.
N. L. Davis, *M. M. & C. B.* ..... Rutland, Vt.
Brat. Div.: E. F. Brooks, *Supt.* Brattleboro, Vt
New London & No'n R. R. 143 m. 22 lo. 303 c.
G. W. Bentley, *G. Supt. & P. A.* New London, Ct.
I. W. Bost, *M. M.* ..... New London, Ct.
S. O. Banks, *M. C. B.* ..... New London, Ct.
Charleston & Savannah Ry. 5 g. 115 m. 17 lo. 98 c.
H. S. Haines, *Gen. Man.* ..... Savannah, Ga.
C. S. Gadsden, *Gen. Supt.* ..... Charleston, S. C.
H. A. Ulmo, *M. M.* ..... Savannah, Ga.
Charlotte, Columbia & Augusta R. R. (*See Rich. & D.*)
Chateaugay R. R. 3 g. 34 m. 6 lo. 125 cars.
A. L. Inman, *Gen. Man.* ..... Salisbury, N. Y.
J. M. Davis, *Supt. & M. M.* ..... Plattsburg, N. Y.
Chattarol Ry. 4-8½ g. 43 miles 11 loco. 483 cars.
C. H. Rockwell, *Gen. Man. & P. A.* Ashland, Ky.
J. R. Martin, *M. M.* ..... Ashland, Ky.
Joseph P. Burleigh, *M. C. B.* ..... Ashland, Ky.
Cheraw & Chester R. R. 3 g. 30 m. 3 lo. 36 cars.
W. H. Harding, *Pres. & Supt.* ..... Chester, S. C.
A. M. Manning, *M. M.* ..... Chester, S. C.
Cheraw & Darlington R. R. (*See Wil. & Wel.*)
Cheraw & Salisbury R. R. (*See Wil. & Wel.*)
John Postel, *Manager.* ..... Cedartown, Ga.
C. E. Scruton, *M. M. & C. B.* ..... Cedartown, Ga.
Chesapeake, Ohio & So.-W'n 4-9 g. 398 m. 39 lo. 980 c.
D. W. C. Brown, *G. S. & Pur. Agt.* ..... do.
Louisville, Ky.
F. H. Britton, *Mast. Trans.* ..... Paducah, Ky.
W. D. Robb, *S. M. P. & M.* ..... Elizabethtown, Ky.
Geo. Dicker, *M. M.* ..... Elizabethtown, Ky.
H. A. Wentzell, *M. M.* ..... Paducah, Ky.
Chesapeake & Ohio Ry. 4-8½ g. 642 m. 133 lo. 3,543 c.
C. W. Smith, *Gen. Man.* ..... Richmond, Va.
D. A. Sweet, *Asst. to Gen. Man* Richmond, Va.
A. H. Wood, *Asst. Gen. Supt.*, Huntington, W. Va.
A. S. Emmons, *Pur. Agt.* ..... Richmond, Va.
John McFarland, *Supt. M. P.* ..... Richmond, Va.
Eastern Div.: T. Smith, *Supt.* ..... Richmond, Va.
J. N. King, *M. C. B.* ..... Richmond, Va.
Hunt. Div.: W. P. Harris, *Supt.* ..... Hinton, W. Va.
T. L. Chapman, *Asst. Supt. M. P.* ..... do.
H. C. Bassinger, *M. C. B.* Huntington, W. Va.
Lex. Div.: J. D. Yarrington, *Supt.* Lexington, Ky.
Chesapeake & Ohio Ry. 4-8½ g. 80 m. 30 lo. 400 cars.
R. Stewart, *Gen. Man.* ..... Keene, N. H.
H. H. Stone, *Pur. Agt.* ..... Keene, N. H.
F. A. Perry, *M. M.* ..... Keene, N. H.
A. E. Howard, *G. For. Car Sh.* ..... Keene, N. H.
Chester & Lenoir Ry. 3 g. 50 m. 3 lo. 23 cars.
James Mason, *Supt.* ..... Yorkville, S. C.
T. P. Beard, *M. M.* ..... Yorkville, S. C.
Chicago, B. & Kan. City Ry. 4-8½ g. 181 m. 9 lo. 130 c.
Robt. Forsyth, *Gen. Supt.* ..... Chicago, Ill.
W. H. Bartlett, *Act. M. M.* ..... Burlington, Ia.
Chicago, burlington & Quincy R. R.
4-8½ g. 2,304 m. 721 lo. 18,955 cars.
T. J. Potter, *Gen. Man.* ..... Chicago, Ill.
1,606 miles.
H. B. Stone, *Gen. Supt.* ..... Chicago, Ill.
Geo. C. Smith, *Pur. Agt.* ..... Chicago, Ill.
G. W. Rhodes, *Supt. M. P.* ..... Aurora, Ill.
Wm. Forsyth, *Mech. Eng.* ..... Aurora, Ill.
Ill. Divs.: J. D. Besler, *Supt.* ..... Galesburg, Ill.
Chi. Div.: Geo. Alexander, *Supt.* ..... Aurora, Ill.
L. E. Johnson, *M. M.* ..... Aurora, Ill.
Galesburg Div.: F. C. Rice, *Supt.* Galesburg, Ill.
Robert Colville, *M. M.* ..... Galesburg, Ill.
St. L. Div.: S. B. France, *Supt.* ..... St. Louis, Mo.
A. Forsyth, *M. M.* ..... Beardstown, Ill.
Ia. & Mo. Divs. ..... *Supt.* Burlington, Ia.
East. Div.: O. E. Stewart, *Supt.* Burlington, Ia.
Joel West, *M. M.* ..... Burlington, Ia.
Mid. Div.: J. B. Maxon, *Supt.* ..... Ottumwa, Ia.
West'n Div.: W. B. Ryder, *Supt.* ..... Creston, Ia.
C. W. Eckerson, *M. M.* ..... Creston, Ia.
(2) C., B. & Q. West of Mo. Riv. 393 miles.
G. W. Holdrege, *Gen. Supt.* ..... Omaha, Neb.
Jas. M. Barr, *Pur. Agt.* ..... Omaha, Neb.
D. H. Farnsworth, *Gen. M. M.* Plattsmouth, Neb.
Bur. & Mo. Riv. & Neb. Ry. Divs.:
D. E. Thompson, *Supt.* ..... Lincoln, Neb.
E. Bigman, *M. M.* ..... Lincoln, Neb.
R. V. Div.: A. Campbell, *Supt.* ..... Hastings, Neb.
A. & N. Div.: J. McConnill, *Supt.* ..... Lincoln, Neb.
Chicago, Milwaukee & St. P. R. R.
4-8½ g. 4,383 m. 425 lo. 13,659 cars.
S. S. Merrill, *Gen. Man.* ..... Milwaukee, Wis.
J. T. Gilman, *Supt.* ..... Milwaukee, Wis.
J. T. Crocker, *Pur. Agt.* ..... Milwaukee, Wis.
J. M. Lowry, *Gen. M. M.* ..... Milwaukee, Wis.
E. Fisher, *M. M.* ..... Milwaukee, Wis.
John Baille, *Supt. Car Dept.* ..... Milwaukee, Wis.
(1) H. C. Atkins, *Asst. Gen. Supt.* Milwaukee, Wis.
Chi. Div.: H. Collins, *Supt.* ..... Aurora, Ill.
La Crosse Div.: W. G. Collins, *Supt.* Milwaukee, Wis.
C. Bluffs Div.: A. J. Earling, *Supt.* ..... Marion, Ia.
P. du C. Div. ..... do.
R. B. Campbell, *Supt.* ..... Milwaukee, Wis.
(2) C. H. Prior *Asst. Gen. Supt.* Minneapolis, Minn.
H. & D. Div.: W. Keilie, *Supt.* ..... do.
J. O. Pattle, *M. M.* ..... Minneapolis, Minn.
Ia. & Minn. Div.: H. R. Williams, *Supt.* ..... do.
So. Minn. Div. ..... do.
C. W. Case, *Supt.* ..... Dubuque, Ia.
Ia. & Da. Div.: G. W. Sanborn, *Supt.* Mason City, Ia.
S. Cy. & Da. Div.: J. Jackson, *Supt.* Mason City, Ia.
F. H. Moulton, *M. M.* ..... Yankton, Dak.
Dubuque Div.: C. W. Case, *Supt.* ..... Dubuque, Ia.
John Taylor, *M. M.* ..... Dubuque, Ia.
(3) D. A. Olin, *Asst. Gen. Supt.* ..... Racine, Wis.
So.-Wn. Divs.: D. L. Bush, *Supt.* ..... Racine, Wis.
John Taylor, *M. M.* ..... Racine, Wis.
E. A. Eddy, *M. C. B.* ..... Racine, Wis.
Northern Div.: L. B. Rock, *Supt.* Milwaukee, Wis.
Wm. E. Hiltredge, *M. C. B.* Milwaukee, Wis.
Chicago, Pekin & So.-W'n R.R. 4-8½ g. 88 m. 8 lo. 45 c.
A. H. Crocker, *Rec.* ..... Peoriat, Ill.
J. N. Chilson, *M. C. B.* ..... Streator, Ill.
Chicago, Rock Island & Pac. Ry.
4-8½ g. 1,381 m. 309 lo. 7,760 cars.
R. R. Cable, *V. P. & Gen. Man.* ..... Chicago, Ill.
A. Kimball, *Gen. Supt.* ..... Chicago, Ill.
F. A. Marsh, *Pur. Agt.* ..... Chicago, Ill.
T. B. Peddy, *Gen. M. M.* ..... Chicago, Ill.
B. K. Verbryck, *Gen. M. C. B.* ..... Chicago, Ill.
Ill. Div.: H. Chamberlin, *Supt.* ..... Chicago, Ill.
B. Biester, *M. M.* ..... Chicago, Ill.
Sam'l Pullman, *M. C. B.* ..... Chicago, Ill.
Ia. Div.: H. F. Ray, *Supt.* ..... Des Moines, Ia.
J. G. Crockett, *M. M.* ..... Stuart, Ia.
Jas. E. Morrill, *M. M.* ..... Davenport, Ia.
Chas. M. Leonard, *M. C. B.* ..... Davenport, Ia.
So.-Wn. Div.: G. F. Walker, *Supt.* ..... Trenton, Ia.
R. O. Carscadin, *M. M.* ..... Trenton, Ia.
Chas. R. Best, *M. C. B.* ..... Trenton, Ia.
K. & Des. M. Div.: Jno. Given, *Supt.* ..... Keokuk, Ia.
S. W. Wakefield, *M. M.* ..... Keokuk, Ia.
Henry Barber, *M. C. B.* ..... Keokuk, Ia.
Chi., Saginaw & Can. R. R. 4-8½ g. 38 m. 4 lo. 16 c.
J. A. Elwell, *Gen. Man. & Pur. Agt.* St. Louis, Mich.
Jas. F. Hall, *Supt.* ..... St. Louis, Mich.
Chicago, St. Louis & New Orleans R. R.
4-8½ g. 577 m. 101 lo. 1,013 cars.
J. C. Clarke, *V. P. & G. Man.* ..... New Orleans, La.
L. T. Brien, *Asst. Gen. Man.* New Orleans, La.
C. M. Sheafe, *Gen. Supt.* ..... New Orleans, La.
H. H. Hall, *Pur. Agt.* ..... New Orleans, La.
W. H. Purdy, *Supt. Mach.* McComb City, Miss.
Geo. W. Baxter, *M. C. B.* McComb City, Miss.
So. Div.: C. Anderson, *Acting Supt.* ..... do.
W. P. McKinley, *M. M.* McComb City, Miss.
No. Div.: J. G. Mann, *Supt.* ..... Jackson, Tenn.
J. M. Keith, *M. M.* ..... Jackson, Tenn.
J. F. White, *M. M.* ..... Water Valley, Miss.
Chicago, St. Paul, Minneapolis & Omaha Ry.
4-8½ g. 1,677 m. 131 lo. 4,088 cars.
J. M. Whitman, *Gen. Supt.* ..... St. Paul, Minn.
W. H. S. Wright, *Pur. Agt.* ..... St. Paul, Minn.
Matt. Ellis, *M. M.* ..... St. Paul, Minn.
W. B. Rice, *M. C. B.* ..... St. Paul, Minn.
Ea. Div.: A. A. Hobart, *Supt.* ..... St. Paul, Minn.
No. Div.: P. P. Lerrey, *Supt.* ..... St. Paul, Minn.
St. Paul Div.: J. F. Lincoln, *Supt.* St. Paul, Minn.
Sioux City Div.: H. Spencer, *Supt.* Sioux City, Ia.
F. W. Heintselman, *Asst. For Sh.* Sioux Cy, Ia.
Neb. Div.: G. V. Morford, *Supt.* ..... Omaha, Neb.
Chicago, Texas & Mexican Central Ry.
4-8½ g. 52 m. 4 lo. 60 cars.
Gen. Supt. ..... Dallas, Tex.
Chas. Howard, *Pur. Agt.* ..... Chicago, Ill.
Chicago & Alton R. R. 4-8½ g. 840 m. 213 lo. 6,148 c.
J. C. McMullin, *Gen. Man.* ..... Chicago, Ill.
C. H. Chappell, *Act. Gen. Man.* ..... Chicago, Ill.
W. F. Merrill, *Gen. Supt.* ..... Chicago, Ill.
A. V. Hartwell, *Pur. Agt.* ..... Chicago, Ill.
Wm. Wilson, *Supt. of Mach.* Bloomington, Ill.
Jos. Townsend, *G. For. Car Dept.* ..... do.
Chi. Div.: A. M. Richards, *Supt.* Bloomington, Ill.
St. Louis Div.: T. M. Bates, *Supt.* Woodhouse, Ill.
Kan. Cy. Div.: O. Vaughan, *Supt.* ..... Slater, Mo.
Wm. McPhail, *M. M.* ..... Slater, Mo.
Chi. & East'n Ill. 4-8½ g. 248 m. 56 lo. 3,500 cars.
O. S. Lyford, *Gen. Supt.* ..... Chicago, Ill.
D. R. Patterson, *Pur. Agt.* ..... Chicago, Ill.
P. W. Drew, *M. Trans.* ..... Chicago, Ill.
Allen Cooke, *M. M.* ..... Danville, Ill.
Chicago & Grand Trunk Ry. (*See Grand Trunk.*)
Chicago & Iowa R. R. 4-8½ g. 104 m. 10 lo. 257 cars.
T. J. Potter, *Gen. Man.* ..... Chicago, Ill.
W. H. Holcomb, *Gen. Supt.* ..... Rochelle, Ill.
H. S. Bryan, *M. M.* ..... Aurora, Ill.
Chicago & Northwestern Ry.
4-8½ g. 3,476

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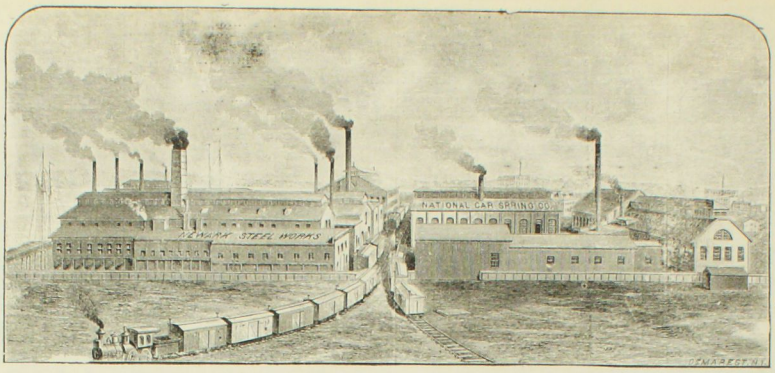

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MANUFACTURERS OF

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IN THE PATENT FIGHT

BETWEEN

D. A. HOPKINS, of 113 Liberty Street, N. Y.,

PATENTEE AND MANUFACTURER OF

SELF-FITTING JOURNAL BEARINGS,

AND

T. V. LE ROY,

A SECOND DECISION WAS RENDERED JUNE 7, 1881,

IN FAVOR OF HOPKINS.

The closing paragraphs of said decision read as follows:

"As the proofs stand, therefore, Hopkins was the first to conceive, the first to disclose to others, the first to embody in models, the first to reduce to practice, and the first to apply for a patent. Le Roy was first to obtain a patent, but under circumstances which do not give him the prima facie case which a patent usually implies."

"We must find priority of invention to be with D. A. Hopkins, and affirm the examiner's decision."

H. H. BATES,
R. L. B. CLARKE,
R. G. DYRENFORTH,
Examiners-in-Chief.

WILSON, WALKER & CO.
(LIMITED),
MANUFACTURERS OF ALL KINDS OF
RAILROAD CAR AND LOCOMOTIVE FORGINGS,
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HAND CARS, PUSH CARS, MINE CARS,
RAILROAD AND MINE SUPPLIES,
BALLAST UNLOADERS,
CAR AND ENGINE Castings.

BUCYRUS FOUNDRY & MFG. CO., BUCYRUS, OHIO.

ALSO
SOLE MANUFACTURERS UNDER LETTERS PATENT OF THE
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PORTABLE Machines for Use by Bridge, Engine and Boiler Makers.
PORTABLE Drilling, Tapping, Boring, and Reaming Machines
PORTABLE Machines for Wood Boring, Polishing, and Emery Wheel Grinding.
STOW FLEXIBLE SHAFT Co., Limited,
1505-1509 PENNSYLVANIA AVENUE,
PHILADELPHIA, - - PA.

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J. C. Sherman, *M. C. B.*..... Crown Point, N. Y.
Cumberland Valley R. R. 4-9 g. 125 m. 21 lo. 430 cars.
J. F. Boyd, *Supt.*.....Chambersburg, Pa.
A. S. Hull, *M. M.*.....Chambersburg, Pa.
C. W. Wicker, *F. C. R.*.....Chambersburg, Pa.
Cumberland & Penn. R. R. 4-8½ g. 55 m. 28 lo. 625 c.
P. L. Burwell, *Gen Supt & P. A.*Cumberland, Md.
N. W. Howson, *Mast. of Mach.*Mt. Savage, Md.
Nathan Binix, *M. C. B.*.....Mt. Savage, Md.

D

Danbury & Norwalk R. R. 4-8½ g. 33 m. 6 lo. 100 c.
L. W. Sandiforth, *G. Supt. & P. A.*.S. Norwalk, Ct.
N. M. George, *M. M. & C. B.*.....Danbury, Conn.
Danville, Mocksville & So. Wn. R. R. ..3 g. 28 m.
H. W. Goodrich, *Ch. Eng.*.....Leakesville, N. C.
Danville, Olney & O. R. R. R. 4-8½ g. 110 m. 4 lo. 83 c.
Jas. R. Maxwell, *G. Man. & P. A.*.....Olney, Ill.
J. M. Graham, *Supt.*.....Kansas, Ill.
Louis Parisoe, *M. M & C. B.*.....Kansas, Ill.
Dayton & Union R. R. .....(*See Ohio Ry.*)
Del., Lackawanna & W. and N. Y. Lack. & W. R. Rs.
4-8½ g. 670 m. 348 lo. 26,187 cars.
Wm. F. Halstead, *Gen. Supt.*.....Scranton, Pa.
G. W. B. Cushing, *Pur. Agt.*.....New York, N. Y.
Walter Dawson, *Mast. of Mach.*.....Scranton, Pa.
Robt. McKenna, *M. C. B.*.....Scranton, Pa.
Bloomsb'g Div.: C. Graham, *M. M.*.Kingston, Pa.
Utica Div.: A. C. Salisbury, *Supt.*.....Utica, N. Y.
Thos. Thatcher, *M. M.*.....Utica, N. Y.
Morris & Essex Div.; Sussex; P. & D. and C. R. Rs.
A. Reasoner, *Supt.*.....Hoboken, N. J.
Wm. H. Lewis, *M. M.*.....Kinesland, N. J.
J. W. Baker, *Mast. Car Rep.*.....Dover, N. J.
Oswego & Syracuse Div.:
W. B. Phelps, *Supt.*.....Oswego, N. Y.
Jas. Buchanan, *M. M.*.....Syracuse, N. Y.
Syracuse, Binghamton & New York R. R.
4-8½ g. 81 m. 30 lo. 598 cars.
W. K. Niver, *Gen. Supt.*.....Syracuse, N. Y.
Jas. Buchanan, *M. M.*.....Syracuse, N. Y.
Delaware Western R. R. 4-8½ g. 20 m. 4 lo. 35 cars.
David Connell, *Supt.*.....Wilmington, Del.
Delaware & Chesapeake R. R. 4-8½ g. 54 m. 5 lo. 160 c.
O. S. Sanford, *Supt.*.....Oxford, Md.
Joseph A. Baynard, *M. M.*.....Oxford, Md.
Chas. E. Mason, *M. C. B.*.....Oxford, Md.
Delaware & Hudson Canal Co.
4-3 and 4-8½ g. 596 m. 151 lo. 9,248 cars.
C. F. Young, *Gen. Man.*.....Honesdale, Pa.
C. F. Young, *Pur. Agt.*.....Albany, N. Y.
R. C. Blackall, *Supt. of Mach.*.....Albany N. Y.
Susq. Div.: G. D. Hammond, *Supt.* Albany, N. Y.
G. A. Jones, *M. M.*.....Oneonta, N. Y.
J. R. Skinner, *M. C. B.*.....Oneonta, N. Y.
Sar. & Ch. Divs.: T. Voorhees, *Supt.*.....Carbondale, Pa.
J. L. Corey, *M. M.*.....Green Island, N. Y.
Chr. Körner, *M. C. B.*.....Green Island, N. Y.
Pa. Div.: R. Manville, *Supt & Pur. Agt.* and
S. H. Dotterer, *M. M.*.....Carbondale, Pa.
T. Orchard, *M. C. B.*.....Carbondale, Pa.
Denver & New Orleans. 4-8½ g. 140 m. 11 lo. 400 c.
C. W. Fisher, *Gen. Man.*.....Denver, Col.
Chas. Wheeler, *Pur. Agt.*.....Denver, Col.
S. P. Weller, *M. M & M. C. B.*.....Denver, Col.
Denver & Rio Grande Ry. 3 g. 1,062 m. 170 lo. 4,617 c.
D. C. Dodge, *Gen. Man.*.....Denver, Col.
Henry Wood, *Gen. Supt.*.Salt Lake City, Utah.
Geo. W. Ristin. *Asst. Gen. Man.*.....Denver, Col.
A. B. Garner, *Pur. Agt.*.....Denver, Col.
N. W. Sample, *M. M.*.....Syracuse, N. Y.
M. C. B......Burnham, Col.
1st Div.: W. H. Bancroft, *Supt.*....S. Pueblo, Col.
2d Div.: Cole Lydon, *Supt.*.....Alamosa, Col.
3d Div.: G. W. Cook, *Supt.*.....Leadville, Col.
4th Div.: R. M. Ridgway, *Supt.*.....Salida, Col.
5th Div.: J. A. Myers
Des Moines & Ft. Dodge. 4-8½ g. 143 m. 13 lo. 232 c.
C. N. Gilmore, *Supt.*.....Des Moines, Ia.
John McGraval, *M. M.*.....Grand Junction, Ia.
E. A. Avery, *M. C. B.*.....Grand Junction, Ia.
Det., Gr. H. & Mil. Ry. 4-8½ g. 189 m. 36 lo. 478 c.
G. R. Nash, *Gen. Man.*.....Detroit, Mich.
John S. Lorimer, *Storekeeper*.....Detroit, Mich.
W. J. Morgan, *Supt.*.....Detroit, Mich.
W. Parker, *Mech. Supt.*.....Detroit, Mich.
Det., Lansing & No'n R. R. 4-8½ g. 222 m. 84 lo. 1,027 c
John B. Mulliken, *Gen. Man.*.....Detroit, Mich.
Allan Bourn, *Pur. Agt.*.....Detroit, Mich.
Thos. M. Fish, *Gen. Supt.*.....Ionia, Mich.
G. C. Watrous, *M. M. & C. B.*.....Ionia, Mich.
Det., Mack. & Marq. R. R. 4-8½ g. 151 m. 16 lo. 112 c
D. McCool, *Gen. Supt.*.....Marquette, Mich.
E. W. Allen, *Pur. Agt.*.....Marquette, Mich.
John Wilson, *Mech. Supt.*.....Marquette, Mich.
Dorchester & Delaware R. R. 4-8½ g. 33 m.
Thos. E. Wright, *Supt.*.....Cambridge, Md.
Dubuque & Dakota R. R. 4-8½ g. 64 m. 2 lo. 54 cars.
A. C. Goodrich, *Supt.*.....Waverly, Ia.
W. S. Couch, *Pur. Agt.*.....Dubuque, Ia.
Duck River Valley R. R. .....3 g. 34 m.
Geo. Childress, *Supt.*.....Columbia, Tenn.
Dunkirk, Allegheny Valley & Pittsburgh R. R.
4-8½ g. 91 m. 14 lo. 102 cars.
D. Thayer, *Gen. Supt.*.....Dunkirk, N. Y.
R. C. Moore, *Pur. Agt.*.....New York, N. Y.
J. C. Haggett *M. M. & C. B.*.....Dunkirk, N. Y.

E

East Broad Top R. R. .....3 g. 30 m. 6 lo. 191 cars.
A. W. Sims, *Supt.*.....Orbisonia, Pa.
A. B. Greenwood, *M. M.*.....Orbisonia, Pa.
East Tennessee, Virginia & Georgia R. R.
7 g. 1,186 m. 153 lo. 1,597 cars.
Henry Fink, *V. P. & Gen. Man.*Lynchburg, Va.
J. F. O'Brien, *Gen. Supt.*.....Knoxville, Tenn.
W. A. Harrison, *Pur. Agt.*.....Knoxville, Tenn.
East Tenn. Div. and No. Car. and Ohio Branches:
F. K. Huger, *Supt.*.....Knoxville, Tenn.
B. J. Sitton, *M. M.*.....Knoxville, Tenn.
Jos. Armbruster, *M. C. B.*.....Knoxville, Tenn.
Alabama Div.: J. M. Bridges, *Supt.*.....Selma, Ala.
Simon Gray, *M. M.*.....Selma, Ala.
W. W. Pierce, *M. C. B.*.....Selma, Ala.
Memphis & Charleston R. R. (Div.):
H. B. Pegram, *Jr., Supt.*.....Memphis, Tenn.
H. N. Burford, *M. M.*.....Memphis, Tenn.
Macon & Brunswick Div.:
J. F. Mallory, *Supt.*.....Macon, Ga.
O. H. Beale, *M. M.*.....Macon, Ga.
Ga. Div.: W. V. McCracken, *Supt.*.....Atlanta, Ga.
M. J. Rogers, *M. M.*.....Atlanta, Ga.
East & West R. R. of Alabama.
John Postell, *Manager*.....Cross Plain, Ala.
Eastern R. R. of N. H. 4-8½ g. 283 m. 96 lo. 2,308 cars.
Payson Tucker, *Gen. Man.*.....Boston, Mass.
D. W. Sanborn, *Mast. of Trans.*.Boston, Mass.
G. F. Bird, *Pur. Agt.*.....Princess Anne, Md.
Amos Pillsbury, *S. M. P. & M.*...E. Boston, Mass.
J. D. Billings, *G. For. Car Dept.*...Salem, Mass.
Con'y Div.: J. W. Sanborn, *Supt.*Wolfboro', N. H.
Eastern Kentucky R. R. 4-8½ g. 34 m. 5 lo. 123 c.
H. W. Bates, *Man. & Pur. Agt.*...Riverton, Ky.
D. S. Weaver, *M. M.*.....Riverton, Ky.
Eastern Shore R. R. 4-8½ g. 38 m. 2 lo.
W. Thompson, *Supt.*.....Princess Anne, Md.
F. Hartridge, *M. M.*.....Princess Anne, Md.
Elberton Air-Line R.R. (*See Rich. & Dan. Ry. Brs.*)
Erie & Pittsburg R. R. .....(*See Penna. Co.*)
Eureka & Palisade R. R. 3 g. 97 m. 7 lo. 124 cars.
B. Gilman, *Gen. Supt & Pur. Agt.*Eureka, Nev.
E. C. Mills, *M. M.*.....Palisade, Nev.
A. S. Longley, *M. C. B.*.....Riverside, Ky.
Europ. & No. Amer. Ry. 4-8½ g. 114 m. 15 lo. 557 c.
F. W. Cram, *Supt. & Pur. Agt.*...Bangor, Me.
A. O. Bailey, *M. M. & C. B.*Mattawamkeag, Me.
Evansville, Paducah & Cairo Line. .....200 miles.
G. J. Grammer, *Supt.*.....Evansville, Ind.
Evansville, Rockport & Ft Ry. 4-9 g. 71 m. 6 lo. 98 c.
H. L. Shepard, *Supt.*.....Evansville, Ind.
Evansv. & Terre Haute. 4-8½ g. 145 m. 26 lo. 900 c.
C. J. Hepburn, *Gen. Supt.*.....Evansville, Ind.
John Torrance, *Gen. For.*.....Evansville, Ind.

F

Fitchburg R. R.. 4-8½ g. 189 m. 100 lo. 3,315 cars.
John Adams, *Gen. Supt.*.....Boston, Mass.
E. K. Turner, *Asst. Supt.*.....Fitchburg, Mass.
F. S. Pratt, *Pur. Agt.*.....Boston, Mass.
G. A. Coolidge, *Supt. M. P.*.....Boston, Mass.
W. A. Foster, *Asst. Supt. M. P.*.Fitchburg, Mass.
J. W. Marden, *M. C. B.*.....Charlestown, Mass.
Flint & Pere Marq. 4-8½ g. 345 m. 68 lo. 1,854 cars.
H. C. Potter, *Gen. Man.*.....E. Saginaw, Mich.
D. Edwards, *Asst. Gen. Man.*.E. Saginaw, Mich.
G. G. Cook, *Pur. Agt.*.....E. Saginaw, Mich.
Sanford Keeler, *Gen. Supt.*..E. Saginaw, Mich.
W. F. Potter, *Supt.* (E. Div.)..E. Saginaw, Mich.
M. V. Meredith, *Supt.* (W. Div.)E. Saginaw, Mich.
T. J. Hatswell, *M. M.*.....E. Saginaw, Mich.
R. McPherson, *M. C. B.*.....E. Saginaw, Mich.
Florida Central & Western R. R.
5 g. 234 m. 16 lo. 160 cars.
Wm. M. Davidson, *Gen. Man* Jacksonville, Fla.
Jas. S. Elvyn, *Supt.*.....Tallahassee, Fla.
Florida Southern Ry. .....3 g. 91 m. 6 lo. 96 cars.
H. S. Ming, *Gen. Supt.*.....Palatka, Fla.
M. R. Miller, *M. M. & C. B.*.....Palatka, Fla.
Florida Transit R. R. .....5 g. 224 m.
D. E. Maxwell, *Gen. Supt.*.....Fernandina, Fla.
John Hedges, *Pur. Agt.*.....Fernandina, Fla.
R. V. Dahoney, *M. M.*.....Fernandina, Fla.
G. Hernandez, *M. C. B.*.....Fernandina, Fla.
Fonda, Johnst'n & Gloversv. 4-8½ g. 26 m. 5 lo. 18 c.
Lawton Caten, *Supt.*.....Gloversville, N. Y.
Fond du Lac, Amboy & Peoria. 3 g. 30 m. 2 lo. 35 c.
Alonzo Hilmyer, *Supt. & P. A.*Fond du Lac, Wis.
Fort Dodge & Fort Ridley R. R. .....4-8½ g.
G. R. Pearson, *Supt.*.....Fort Dodge, Ia.
Ft. Madison & No.-West'n Ry. 3 g. 41 m. 4 lo. 130 c.
S. B. Kenrick, *Supt. & Pur. Agt.*Ft. Madison, Ia.
L. L. Lamb, *M. M. & C. B.*.....Ft. Madison, Ia.
Ft. Wayne, Cin. & Louisv. 4-8½ g. 108 m. 9 lo. 240 c.
White Water R. R. 4-8½ g. 62 m. 5 lo. 170 cars.
W. W. Worthington, *Gen. Supt.*...Ft. Wayne, Ind.
T. H. Raherkorn, *M. M.*.....Ft. Wayne, Ind.
Wm. Knight, *M. C. B.*.....Ft. Wayne, Ind.
Fulton County N. G. Ry. 3 g. 61 m. 3 lo. 100 cars.
A. C. Atherton, *Gen. Supt. & P. Agt.*Lewiston, Ill.

G

Galveston, Harrisburg & San Antonio Ry.
4-8½ g. 492 m. 47 lo. 1870 cars.
A. N. Towne, *Gen. Man.*.....Galveston, Tex.
E. G. Thompson, *Supt.*.....Houston, Tex.
El Paso Div.: Jas. Campbell, *Supt.*..El Paso, Tex.
A. L. Bonner, *M. M.*.....El Paso, Tex.
San Anto. Div.: W. G. Van Vleck, *Supt.*.
San Antonio, Tex.
J. J. Ryan, *M. M.*.....
Houston Div.: H. Flanders, *Supt.*.Harrisburg, Tex.
D. D. Davis, *M. M.*.....Harrisburg, Tex.
Louisiana Div.: W. Irwin, *Supt.*....Houston, Tex.
D. C. Smith, *M. M.*.....Houston, Tex.
Galveston, Houston & Henderson R. R.
4-8½ g. 50 m. 17 lo. 212 cars.
W. H. Harding, *G. Man. & P. Agt.*Galveston, Tex.
Allen McCoy, *Supt.*.....Galveston, Tex.
J. G. Conlon, *M. M.*.....Galveston, Tex.
Geneva, Ithaca & Sayre R. R. .....(*See Lehigh Val.*)
Georgia R. R. .....5 g. 307 m. 42 lo. 958 cars.
John W. Green, *Gen. Man.*.....Augusta, Ga.
John S. Cook, *M. M.*.....Augusta, Ga.
T. M. Freval, *M. C. B.*.....Augusta, Ga.
Georgia Pacific Ry. (Miss. Div.) 3 g. 43 m. 2 lo. 44 c.
G. J. Foreacre, *Supt.*.....Atlanta, Ga.
W. M. Sutton, *Pur. Agt.*.....Greenville, Miss.
Benj. Davis, *M. M.*.....Greenville, Miss.
J. B. Shelton, *M. C. B.*.....Greenville, Miss.
Grand Haven & R. R. .....(*See Chic. & W. Mich.*)
Grand Junction Ry. .....(*See Midland of Can.*)
G'd Rap., Newaygo & L. S. R. R. (*See Chic. & W. M.*)
Grand Rapids & Indiana. 4-8½ g. 456 m. 20 lo. 1,500 c.
Joseph Hickson, *Gen. Man.*.....Montreal, Can.
Wm. Wainright, *Asst. Man.*.....Montreal, Can.
Gr. Tr. Western. 4-8½ g. 1,307 m. 434 lo. 8,363 c.
Jno. Taylor, *Gen. Storekeeper*.Montreal, Can.
Herbert Wallis, *Mech. Supt.*..Montreal, Can.
Wm. Wainright, *Asst. Supt.*.....Montreal, Can.
F. R. F. Brown, *Man. Lo. Wks.*Montreal, Can.
J. Haskoni, *Div. M. S.*.....Richmond, P. Q.
F. L. Wanklyn, *Div. M. S.*.....Brockville, Ont.
J. Davis Barnett, *Div. M. S.*.....Stratford, Ont.
Chi. & Gr. Trunk Ry. 4-8½ g. 330 m. 56 lo. 1,191 c.
C. J. Shakell, *Gen. Man.*.....Chicago, Ill.
W. H. Pettibone, *Supt.*.....Battle Creek, Mich.
A. Judd, *Pur. Agt.*.....Fort Gratiot, Mich.
H. Roberts, *Asst. M. S.*.....Port Huron, Mich.
Great West'n Div.: 4-8½ g. 823 m. 216 lo. 5,039 c.
Chas. Stiff, *Supt.*.....Hamilton, Ont.
E. R. Baines, *Store Kpr.*.....London, Ont.
C. K. Domville, *Mech. Supt.*.Hamilton, Ont.
C. F. Hanson, *Lo. For.*.....London, Ont.
Jas. Wilson, *Supt. Car Dept.*.London, Ont.
Green Bay, Winona & St. Paul R. R.
4-8½ g. 250 m. 19 lo. 500 cars.
Timothy Case, *Gen. Man. & P. A.*Green Bay, Wis.
A. Fenwick, *M. M.*.....Ft. Howard, Wis.
Gulf, Col. & Santa Fe Ry. 4-8½ g. 536 m. 43 lo. 1,400 c.
John Sealy, *Gen. Man.*.....Galveston, Texas.
F. P. Killeen, *Asst. Gen. Man.*Galveston, Texas.
Jno. W. Thorne, *Pur. Agt.*....Galveston, Texas.
G. B. Nichols, *M. M.*.....Galveston, Texas.
W. H. Martin, *M. C. B.*.....Galveston, Texas.
Gulf, W'n Texas & Pac. Ry. 4-8½ g. 68 m. 6 lo. 70 c.
M. D. Somerville, *Pr. & Supt.*.....Cuero, Texas.
James Mooney, *M. M.*.....Cuero, Texas.

H

Halifax & Cape Breton Ry. 4-8½ g. 79 m. 9 lo. 268 c.
H. Abbott, *Manager*.....New Glasgow, N. S.
Hannibal & St. Jo. R. R. 4-8½ g. 202 m. 70 lo. 1,869 c.
John R. Larson, *Gen. Man.*.....Hannibal, Mo.
W. R. Woodard, *Supt.*.....Hannibal, Mo.
T. L. Dunn, *Ch. Eng. & Pur. Agt.*Hannibal, Mo.
C. H. Long, *Gen. Mech. Insp.*.Hannibal, Mo.
Hanover Junction, Hanover & Gettysburg R. R.
4-8½ g. 74 m. 9 lo. 106 cars.
H. D. Scott, *Gen. Supt.*.....Hanover, Pa.
John J. Bingley *M. M.*.....Hanover, Pa.
Henry Britcher, *M. C. B.*.....Hanover, Pa.
Harrisburg, Portsmouth, Mt. Joy & Lancaster R. R.
R. H. Middleton, *Supt.*.....Rolling Springs, Pa.
Hartford & Conn. Val. R. R. 4-8½ g. 45 m. 9 lo. 196 c.
Samuel Bard, *Gen. Man.*.....Hartford, Ct.
Levi Woodhouse, *Asst. Supt.*.....Hartford, Ct.
S. E. Brewer, *M. M. & C. B.*.....Hartford, Conn.
Hartford & Conn. W'n R. R. 4-8½ g. 110 m. 9 lo. 268 c.
John F. Jones, *Supt.*.....Hartford, Ct.
J. C. Barton, *M. M.*.....Hartford, Ct.
Housatonic R. R. 4-8½ g. 120 m. 22 lo. 400 cars.
W. H. Yeomans, *Supt.*.....Bridgeport, Ct.
D. S. Draper, *Pur. Agt.*.....Bridgeport, Ct.
N. Shipman, *M. M.*.....Falls Village, Ct.
J. J. Ferris, *M. C. B.*.....Falls Village, Ct.
Houston Belt Ry. .....4-8½ and 3 gauge 50 miles.
E. H. Worden, *V. P. & Gen. Man.*Houston, Tex.
Houston, East & West Tex. Ry. 3 g. 120 m. 10 lo. 478 c.
Paul Bremond, *Pr. & Pur. Agt.*.Houston, Tex.
E. L. Bremond, *Gen. Man.*.....Houston, Tex.
B. O. Diffey, *M. M.*.....Houston, Tex.
C. F. Schelewa, *M. C. B.*.....Houston, Texas.
Houston & Tex. Cen. Ry. 4-8½ g. 750 m. 78 lo. 2,520 c.
G. Jordan, *V. Pr. & Gen. Man.*...Houston, Tex.
A. H. Swanson, *Gen. Supt.*.....Houston, Tex.
E. S. Lacoba, *Pur. Agt.*.....New York, N. Y.
L. C. Noble, *Gen. M. M.*.....Houston, Tex.
James McGee, *M. C. B.*.....Houston, Tex.
So. & W. Div.: G. Howe, *Supt.*.Houston, Tex.
No. & Mi. Divs.: G. A. Quinlan, *Supt.*Dallas, Tex.
C. H. Burns, *Asst. M. M.*.....Corsicana, Tex.
No.-W'n Div.: Donald Allen, *Supt.*.....Waco, Tex.
Humeston & Shenandoah R. R.
4-8½ g. 85 m. 5 lo. 72 cars.
F. O. Wyatt, *Gen. Man.*.....Clarinda, Ia.
M. B. Snyder, *M. M.*.....Clarinda, Ia.
Huntingdon & Br. Top Mt. 4-8½ g. 62 m. 18 lo. 69 c.
Geo. P. Gage, *Gen. Supt.*.....Huntingdon, Pa.
Samuel B. Knight, *Pur. Agt.*.Philadelphia, Pa.
William Barkla. *M. M.*.....Saxton, Pa.

I

Illinois Central R. R. 4-8½ g. 1,554 m. 224 lo. 6,172 c.
Jas. C. Clark, *Gen. Man.*.....Chicago, Ill.
E. T. Jeffery, *Gen. Supt.*.....Chicago, Ill.
C. A. Beck, *Asst. Gen. Supt.*.....Chicago, Ill
O. Ott, *Pur. Agt.*.....Chicago, Ill
Henry Schlacks, *S. of Mach.*.....Chicago, Ill.
W. B. Snow, *M. M. Car Works*.....Chicago, Ill.
Chic. Div.: T. J. Hudson, *Supt.*.....Cairo, Ill.
Wm. Renshaw, *Act. M. M.*.....Chicago, Ill.
Mid. Div.: H. L. Friable, *Supt.*.....Pontiac, Ill.
Spring. Div.: W. Wilkinson, *Supt.* Springfield, Ill.
W. B. McKenna, *M. M.*.....Clinton, Ill.
No'n Div.: C. Jacobs, *Supt.*.....Amboy, Ill.
J. P. Edams, *M. M.*.....Amboy, Ill.
So. Div.: David Oxley, *M. M.*.....Centralia, Ill.
Ia. Div.: D. W. Parker, *Supt.*.....Dubuque, Ia.
Thos. W. Place, *M. M.*.....Waterloo, Ia.
Illinois Midland Ry. 4-8½ g. 176 m. 12 lo. 611 cars.
D. Hitchcock, *Rec. & Gen. Man.*.....Decatur, Ill.
O. E. Grady, *Train Mast.*.....Decatur, Ill.
Frank Young, *For. Shops*.....Paris Ill.
Illinois & St. Louis R. R. 4-8½ g. 18 m. 5 lo. 405 c.
Thos. McKissock, *Gen. Man.*.....Belleville, Ill.
C. H. Sharman, *Gen. Supt. & P. A.*Belleville, Ill.
W. O. Hewitt, *M. M.*.....Belleville, Ill.
Charles Rotha, *M. C. B.*.....E. St. Louis Ill.
Indiana, Bloomington & Western Ry.
4-8½ g. 711 m. 64 lo. 3,650 cars.
C. E. Henderson, *Gen. Man.*.Indianapolis, Ind.
J. H. Wilson, *Gen. Supt.*.....Indianapolis, Ind.
H. C. Newcomb, *Pur. Agt.*.....Indianapolis, Ind.
B. Warren, *Gen. M. M.*.....Indianapolis, Ind.
Peoria Div.: I. H. Wilson, *Supt.*.Indianapolis, Ind.
E. Hall, *M. M.*.....Urbana, Ill.
St. Louis Div.: I. H. Wilson, *Supt.*.....Indnpls, Ind.
John King, *M. M.*.....Indianapolis, Ind.
Ohio Div.: D. W. Ennis, *Asst. Supt.*Springfield, Ill.
Jos. S. Porter, *M. M.*.....Sandusky, O.
Indiana, Illinois & Iowa R. R. .....63 miles.
J. P. Sholts, *Gen. Man.*.....Kankakee, Ill.
J. P. Shonts, *Supt.*.....Kankakee, Ill.
Indianapolis & Vincennes R. R. .....(*See Ohio & So.*)
Intercolonial Ry. 4-8½ g. 846 m. 135 lo. 4,500 cars.
David Pottinger, *Chief Supt.*.....Moncton, N. B.
T. V. Cooke, *Gen. Storekeeper*..Moncton, N. B.
H. A. Whitney, *Mech. Supt.*.....Moncton, N. B.
Ewd. Shaffer, *M. C. B.*.....Moncton, N. B.
Mone. Div.: J. E. Price, *Supt.* Campbellton, N. B.
Hal. & St. J. Div.: Jas. Coleman, *Supt.*Truro, N. B.
Levis Div.: A. McDonald, *Supt.* Rivière du Loup, Q.
International Ry. 4-8½ g. 60 m. 2 lo. 12 cars.
D. E. McFee, *Supt.*.....Sherbrooke, Que.
International & Gt. N'n R. R. .....(*See Mo. Pac. Ry.*)
Iron Mountain & Helena R. R. 4-8½ g. 37 m. 3 lo. 85 c.
Wm. Bailey, *Pres. & Gen. Man.*.....Helena, Ark.
D. Stillinger, *Supt.*.....Helena, Ark.
F. M. Green, *Pur. Agt.*.....Helena, Ark.
Wm. Summers, *M. C. B.*.....Helena, Ark.
Ithaca, Auburn & Western Ry. 4-8½ g. 38 m.
Fred'k Remington, *Supt.*.....Auburn, N. Y.
Ira Dunning, *M. M.*.....Auburn, N. Y.

J

Jacksonville So.-E'n R. R. 4-8½ g. 54 m. 5 lo. 68 c.
E. S. Greeley, *Supt.*.....Jacksonville, Ill.
Ira Petrie, *M. M.*.....Jacksonville, Ill.
Jacksonv., Pensacola & Mob. (*See Fla. Cen. & W.*)
Jamesville & Washington. 4-8½ g. 22 m. 3 lo. 24 c.
A. Fisher, *Manager*.....Dymond City, N. C.
J. E. Lordley, *M. M. & C. B.*.Dymond City, N. C.
Jeffersonv'l, Madison & Indpls. R. R. (*See Pa. Co.*)
Jersey City & Albany R. R. .....4-8½ g. 38 m.
J. W. McCulloh, *Manager*.....Jersey City, N. J.
Junction Railroad (Interbreaker & Frankford; and Worcester R. Rs. 4-8½ g. 101 m. 61 l. 133 c.
J. & B. Rd.: Thos. Groome, *Supt.*.....Lewes, Del.
Geo. Messick, *M. M.*.....Lewes, Del.
W. H. Virden, *M. C. B.*.....Lewes, Del.
B. & F. and W. Rds.: J. L. Mapes, *Sr.* Berlin, Md.

K

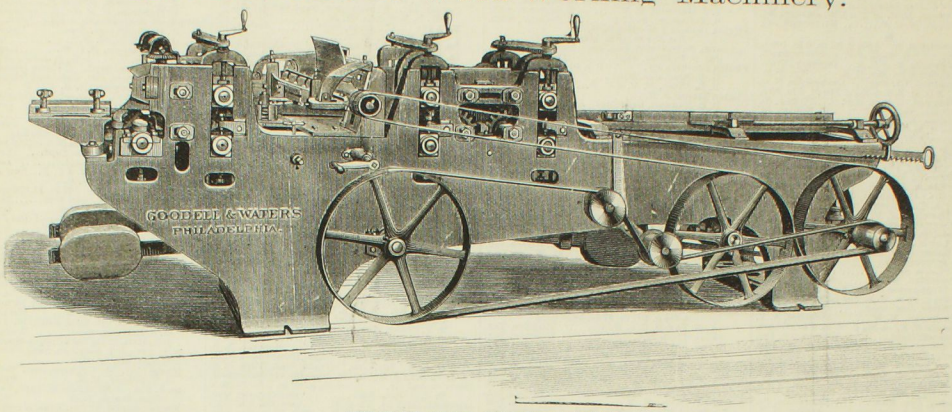
Kansas Central R. R. .....(*See Union Pacific.*)
Kansas Cy, Lawrence & So. Kan. 4-8½ g. 396 m. 787 c.
C. C. Wheeler, *Gen. Man.*.....Topeka, Kan.
J. L. Barnes, *Supt.*.....Lawrence, Kan.
F. M. Smith, *Pur. Agt.*.....Topeka, Kan.
T. D. Volk, *M. M.*.....Ottawa, Kan.
Kansas City, Fort Scott & Gulf R. R.
Geo. H. Nettleton, *Gen. Man.*.Kansas City, Mo.
L. W. Towne, *Gen. Supt.*.....Kansas City, Mo.
H. P. Jaques, *Pur. Agt.*.....Kansas City, Mo.
J. S. McCrum, *M. M.*.....Kansas City, Mo.
A. N. Montler, *M. C. B.*.....Kansas City, Mo.
Kansas City, St. Joseph & Council Bluffs and St. Jo. & Des Moin' s R. Rs. 4-8½ g. 368m. 38 lo. 1,148 cars.
J. F. Barnard, *Gen. Supt. & P. A.*St. Joseph, Mo.
E. A. Chase, *M. M.*.....St. Joseph, Mo.
Thos. Aylesbury, *G. For. Car. Dep.*St. Joseph, Mo.
Kendall & Eldred R. R. .....(*See Olean, B. & W.*)
Kent Co. Rwy. Bay Rds. 4-8½ g. 5,000 c. 2 lo. 13 c.
Fred Gerker, *Gen. Man.*.....Chestertown, Md.
Kentucky Central R. R. 4-9 g. 150 m. 20 lo. 598 cars.
G. W. Bender, *Supt.*.....Covington, Ky.
A. H. Watts, *F. of Mach.*.....Covington, Ky.
J. L. Hackathorn, *M. C. B.*.....Covington, Ky.
Kentucky & South Atlantic Ry. 3 g. 23 m. 3 lo. 52 c.
Geo. B. Harper, *Supt. & P. A.*.Mt. Sterling, Ky.
S. P. Hatfield, *M. M.*.....Mt. Sterling, Ky.
Kinzua R. R. .....(*See Olean, B. & W.*)
Kingston & Pembroke Ry. 4-8½ g. 65 m. 4 lo. 76 c.
B. W. Folger, *Supt.*.....Kingston, Ont.
C. Gildersleeve, *Pur. Agt.*.....Kingston, Ont.
Geo. Becker, *M. M.*.....Kingston, Ont.
Knox & Lincoln R. R. 4-8½ g. 49 m. 5 lo. 96 cars.
C. A. Coombs, *Supt.*.....Bath, Me.
Wm. A. Field, *M. M.*.....Bath, Me.
C. L. Turner, *M. C. B.*.....Bath, Me.
Knoxville & Augusta R. R. 4-6 g. 16 m. 2 lo. 34 cars.
J. M. Hood, *Supt.*.....Knoxville, Tenn.
M. R. Hood, *Pur. Agt.*.....Knoxville, Tenn.

L

Lake Erie & Western Ry. 4-8½ g. 388 m. 43 lo. 1,526 c.
E. H. Waldron, *Gen. Man.*.....La Fayette, Ind.
E. H. Andress, *Pur. Agt.*.....La Fayette Ind.
H. L. Cooper, *Supt. of Equipment*.....Lima, O.
D. S. Hill, *Gen. Supt.*.....Sandusky, O.
Lake Shore & Michigan So'n Ry.
4-8½ g. 1,343 m. 540 lo. 17,115 cars.
John N. Cell, *Gen. Man.*.....Cleveland, O.
P. P. Wright, *Gen. Supt.*.....Cleveland, O.
A. C. Armstrong, *Pur. Agt.*.....Cleveland, O.
James Sedgley, *Gen. M. M.*.....Cleveland, O.
John Kirby, *Gen. M. C. B.*.....Cleveland, O.
Buffalo Div.: C. H. Couch, *Supt.*.....Buffalo, N. Y.
J. S. Graham, *M. M.*.....Buffalo, N. Y.
A. C. Robson, *M. C. B.*.....Buffalo, N. Y.
Frank Divy.: W. H. Canliff, *Supt.*.....Rochester, N. Y.
Erie Div.: C. B. Couch, *Supt.*.....Cleveland, O.
L. O. Gassett, *M. M.*.....Cleveland, O.
Jno. Hutchinson, *M. C. B.*.....Cleveland, O.
Toledo Div.: Thos. Flesher, *Jr., Supt.*Cleveland, O.
J. M. Sanborn, *M. M.*.....Norwalk, O.
W. Sheldon, *M. C. B.*.....Norwalk, O.
Mich. Div.: J. E. Curtis, *Supt.*.....Toledo, O.
Det. Div.: T. J. Charlesworth, *Supt.*Detroit, Mich.
Laundry Div.: W. H. Canliff, *Supt.*.....Rochester, N. Y.
Western Div.: A. G. Amsden, *Supt.*.....Chicago, Ill.
G. W. Stevens, *M. M.* (M.S. Divs.) Elkhart, Ind.
Jno. Hutchinson, *M. C. B.*.....Elkhart, Ind.
Ft. Wayne Br: W. H. Canliff, *Supt.* Jackson, Mich.
Kalamazoo Div:
W. E. Smith, *Supt.*.....Kalamazoo, Mich.
Lebanon Springs R. R. .....4-8½ g.
W. C. Alstyne, *Manager*.....Albany, N. Y.
J. K. Hotaling, *Pur. Agt.*.....Albany, N. Y.
Geo. Tefft, *M. M.*.....Chatham, N. Y.
Lehigh Valley R. R. 4-8½ g. 645 m. 200 lo. 17,817 c.
H. S. Goodwin, *Gen. Supt.*.....Bethlehem, Pa.
L. Chamberlain, *Pur. Agt.*.....Philadelphia, Pa.
John S. Lentz, *M. C. B.*.....Packerton, Pa.
N. J. Div.: Jas. Donnelly, *Supt.* Perth Amboy, N. J.
John I. Kinsey *M. M.*.....So. Easton, Pa.
Coal Rds.: J. L. Blakeslee, *Supt.* Mauch Chunk, Pa.
P. Hofecker, *M. M.*.....Weatherly, Pa.
John Campbell, *M. M.*.....Delano, Pa.
H. M. Div.: A. G. Brodhead, *S.* Mauch Chunk, Pa.
D. Clark, *M. M.*.....Hazleton, Pa.
Wy. Div.: A. Mitchell, *S. & M. M.* Wilkesbarre, Pa.
Pa. & N. Y.; and Geneva, Ithaca & Sayre R. Rs.
Wm. Stevenson, *Supt* .....Sayre, Pa.
J. N. Weaver, *M. M.*.....Waverley, Pa.
Lehigh & Hudson. 4-8½ g. 63 m. 8 lo. 350 cars.
Grinnel Burt, *Gen. Man.*.....Warwick, N. Y.
John Sayre, *Pur. Agt.*.....Warwick, N. Y.
S. Mills, *M. M.*.....Warwick, N. Y.
Ligonier Valley R. R. .....4-9 g. 11 m. 2 lo. 22 cars.
Thos. A. Mellon, *Gen. Manager*...Pittsburg, Pa.
Geo. Senft, *Supt. & P. Agt.*.....Latrobe, Pa.
Little Rock, Miss. River & Texas Ry.
4-8½ g. 160 m. 12 lo. 260 cars.
J. A. Woodson, *G. S. & P. A.* Little Rock, Ark.
F. Hufsmith, *M. M. & C. B.*..Arkansas City, Ark.
Little Rock & Fort Smith. 4-8½ g. 168 m. 12 lo. 353 c.
T. Hartman, *Gen. Supt.*.....Little Rock, Ark.
James Ehlin, *M. M.*.....Argenta, Ark.
James Malone, *M. C. B.*.....Argenta, Ark.
Long Island R. R. 4-8½ g. 325 m. 79 lo. 740 cars.
I. D. Barton, *Supt.*.....Long Island City, N. Y.
Benj. Norton, *Pur. Agt.* Long Island City, N. Y.
C. A. Thompson, *M. M. & C. B.*.....do.
Louis., Evans. & St. L. Ry. 4-8½ g. 254 m. 30 lo. 1,022 c.
Webster Snyder, *Gen. Man.*.....Louisville, Ky.
W. H. Field, *Pur. Agt.*.....Louisville, Ky.
F. M. Mast, *M. M.*.....Evansville, Ind.
Louisville, New Albany & Chicago Ry.
4-8½ g. 470 miles 56 lo. 3,700 cars.
John MacLeod, *Gen. Supt.*.....Louisville, Ky.
G. C. Breed, *Pur. Agt.*.....Louisville, Ky.
Joseph Bettis, *M. M & C. B.*.New Albany, Ind.
Louisville & Nashville R. R.
5 g. 2,090 m. 367 lo. 11,353 cars.
Milton H. Smith, *Gen. Man.*.....Louisville, Ky.
P. P. Huston, *Pur. Agt.*.....Louisville, Ky.
D. W. C. Rowland, *Gen. Supt. Trans.*Louisville, Ky
Reuben Wells, *Supt. Mach.*.....Louisville, Ky
Louis. Div.: and Louis

GOODELL & WATERS,

Manufacturers of Wood-Working Machinery.



KEYSTONE RAPID FEEDING FLOORER

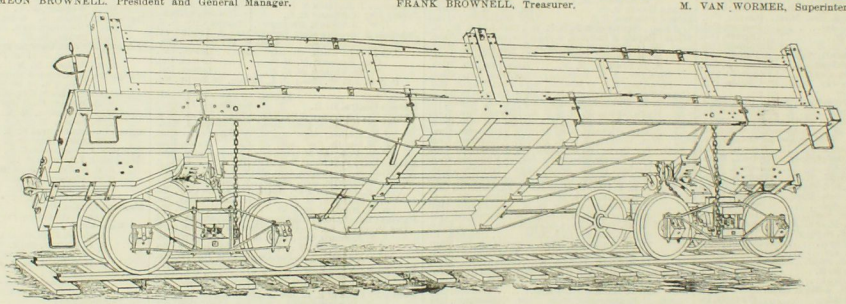
For RAILROAD SHOPS, CAR-BUILDERS, PLANING-MILLS, BRIDGE BUILDERS, SAS DOOR and BLIND MAKERS.

SEND FOR NEW CATALOGUE.

GOODELL & WATERS, Thirty-First and Chestnut Streets, Philadelphia, Pa

THE U. S. CAR CO.'S SCREW LEVER DUMP AND COAL CAR.

SIMEON BROWNELL, President and General Manager. FRANK BROWNELL, Treasurer. M. VAN WORMER, Superintendent.



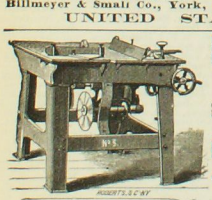
UNDERSIDE VIEW.

(M. VAN WORMER PATENTS.)

This car has a capacity of eighteen to twenty tons, and can be handled by one man, discharging its load instantly. The device can be applied to flat and grain cars. The car is under perfect control at all times, and can be held at any elevation or dumped suddenly if desired. For construction trains, cars with this device would be invaluable. The mechanism is strong, simple and durable. The following railroads and car-builders are building cars with this screw lever attachment, viz.:

Union Pacific Railway Co.
Lehigh Valley Railroad.
Main Central Railroad Co.
Billmeyer & Small Co., York, Pa.
Northern Pacific Railroad Co.
Gilbert Car Mfg. Co., Troy, N. Y.
Pontiac & Pacific Railway, Canada.
Boston & Maine R. R. Co.
Wells & French Car Co., Chicago.
Cleveland Rolling Mills Co., Cleveland.
Gill Car Mfg. Co., Columbus, Ohio.
Rock Island & Mercer County Railroad.
Ontario Car Co., London, Ontario Canada.

UNITED STATES CAR COMPANY, 48 CONGRESS STREET, BOSTON, MASS.



No. 3 Wardwell Saw Bench.

ROLLSTONE MACHINE CO.

Wardwell Saw Benches a specialty.

These machines are in use in the car-shops of the Penn. R. R., B. & O., P. W. & B. B. & A. F. R., Mich Central, and some fifty other of the largest shops in the country

Also, A HEAVY BAND SAW FOR CAR WORK.

ROTARY, STATIONARY, BED & BUZZ PLANERS

And a large number of other machines for car work.

We are dealers in all kinds of Second-Hand Machinery, Engines, Boilers, Iron and Wood-Working Machinery.

Do not buy until you send for new descriptive list, stating just what you want inclosing stamp.

ROLLSTONE MACHINE CO., 131 WATER ST., FITCHBURG, MASS.

DYNAMIC TALLOW

a "Commercial" tallow wholly divested of the scrap, wastes and fat-cells, sometimes amounting to **20 per cent. of the mass** that goes over into the kettles in "rendering out" the crude tallow as it comes from the butcher's blade. By our process this destructive corrosive matter is **all taken out** and there remains only

Pure Beef's Fat Destitute of Acids.

THE BEST VALVE TALLOW.

DYNAMIC TALLOW.

The advantage of such a product for cylinder lubrication is obvious.

Your Orders Invited. Satisfaction Guaranteed.

INLAND OIL COMPANY,

CINCINNATI, O.

STEEL CASTINGS

FROM 1-4 To 10,000 lbs. WEIGHT.

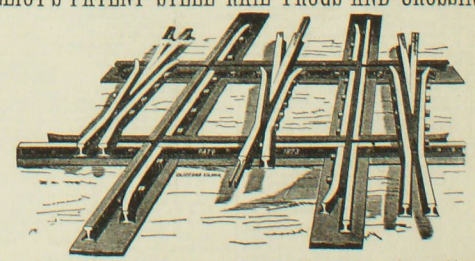
True to pattern, sound and solid, of unequaled strength, toughness and durability. An invaluable substitute for forgings or cast-iron requiring three-fold strength. Gearing of all kinds, Shoes, Dies, Hammer Heads, Cross-Heads for locomotives, etc. 15,000 Crank Shafts and 10,000 Gear Wheels of this steel now running prove its superiority over other steel castings. CRANK SHAFTS, CROSS-HEADS and GEARING specialties. Circulars and Price Lists free.

CHESTER STEEL CASTINGS CO.,

Works: CHESTER, Pa. 407 Library St., PHILADELPHIA.

C. HUBBARD, Agent, 40 Cliff Street, New York.

ELLIOT'S PATENT STEEL RAIL FROGS AND CROSSINGS.



These Frogs and Crossings are made of steel rail, combined with a wrought-iron frame, and bound together transversely with strong bolts, which gives them great strength and durability without destroying their elasticity. They are connected at all ends by Fish-Plate Joints, and lie on the same tie surface as the running rail without any cutting of ties, thus saving a great deal of time and labor in putting in place on track.

Manufactured by H. & H. ELLIOT

East St. Louis.

Cen. Br. Div.: W. W. Fagan, *Supt.* Atchison, Kan.
H. V. Faries, *M. M.* ..... Atchison, Kan.
S. Irvin, *Asst. Supt. Car Dep.* Atchison, Kan.
(1) St. L., I. M. & So. 4-8½ g. 818 m. 141 lo. 4,800 c.
Wm. Kerrigan, *Gen. Supt.* ..... Louis, Mo.
O. A. Haynes, *S. M. P. & M.* ..... De Soto, Mo.
St. Louis Div.: W. H. Harris, *M. M.* De Soto, Mo.
Ark. Div.: R. M. Richardson, *M. M.* Little Rock, Ark.
(2) Texas & Pac. 4-8½ g. 1,322 m. 144 lo. 3,076 c.
E. L. Dudley, *Supt.* ..... Marshall, Tex.
O. A. Haynes, *S. M. P. & M.* ..... Marshall, Tex.
New Or. Div.: J. T. Wheless, *Supt.* Gouldsboro, La.
Perry Sternes, *M. M.* ..... Marshall, Tex.
Eastern Div.: J. Williams, *Supt.* ..... Longview, Tex.
Rio Gr. Div.: G. O. Clinton, *Supt.* Big Springs, Tex.
W. H. Reilly, *M. M.* ..... Fort Worth, Tex.
J. E. Wiggin, *M. M.* ..... Big Springs, Tex.
(3) Int. & G. North. 4-8½ g. 770 m. 73 lo. 1,712 c.
Jos. Harrin, *Supt.* ..... Palestine, Tex.
O. A. Haynes, *S. M. P. & M.* ..... Palestine, Tex.
O. H. Johnson, *M. M.* ..... Palestine, Tex.
Mobile & Ala. Grand Trunk R. R. 5 g. 50 m. 21 lo. 23 c.
Wm. H. Pratt, *Trustee.* ..... Mobile, Ala.
Mobile & Girard R. R. 5 g. 84 m. 7 lo. 112 cars.
W. L. Clark, *Gen. Supt.* ..... Columbus, Ga.
J. C. Albrecht, *M. M.* ..... Columbus, Ga.
A. J. Nix, *M. C. B.* ..... Columbus, Ga.
Mobile & Ohio R. R. 5 g. 528 m. 75 lo. 1,553 cars.
A. L. Rives, *V. Pr. & Gen. Man.* ..... Mobile, Ala.
R. H. Briggs, *Gen. M. M.* ..... Whistler, Ala.
J. T. Booth, *M. C. B.* ..... Whistler, Ala.
So'n Div.: I. G. Motley, *Supt.* ..... Mobile, Ala.
John Fitzgerald, *M. M.* ..... Macon, Miss.
No'n Div.: E. S. Horsford, *Supt.* ..... Natchez, Miss.
M. T. Carson, *M. M.* ..... Jackson, Tenn.
Mobile & Spring Hill R. R. 5 g. 8 m. 10 lo. 90 cars.
T. Hindle, Ala. ..... Mobile, Ala.
Moni Alto R. R. 4-9 g. 21 m. 2 lo. 3 cars.
G. B. Weistling, *Supt. & P. A.* ..... Mont Alto, Pa.
Montpelier & Wells Riv. R. R. 4-8½ g. 38 m. 3 lo. 76c.
Supt. ..... Montpelier, Vt.
Morgan's Louisiana & Tex. R. R. 4-8½ g. 165 m.
O. Pandeley, *Supt.* ..... New Orleans, La.
C. Trumpy, *Pur. Agt.* ..... New Orleans, La.
N. Tilton, *M. M.* ..... Algiers, La.
Wm. O'Brien, *M. C. B.* ..... Algiers, La.
Muncy Creek Ry. 4-8½ g. 10 m.
Benj. G. Welch, *Rec. & P. Agt.* Hughesville, Pa.
J. V. Chamberlain, *Supt. & M. M.* do.

N

Nashville, Chattanooga & St. Louis R'y.,
5 g. 508 miles 87 lo. 1,970 cars.
J. W. Thomas, *G. Supt. & P. Agt.* Nashville, Tenn.
M. J. C. Wrenne, *Supt.* ..... Nashville, Tenn.
James Cullen, *M. M. & C. B.* ..... Nashville, Tenn.
Natchez, Jackson & Col. R. R. 3-6 g. 98 m. 7 lo. 72 c.
G. Frost, *Gen. Supt.* ..... Natchez, Miss.
Naugatuck R. R., 4-8½ g. 61 miles, 14 lo. 384 cars.
Geo. W. Beach, *Supt.* ..... Waterbury, Ct.
Henry Hanford, *M. M.* ..... Bridgeport, Ct.
Geo. W. Gray, *M. C. B.* ..... Bridgeport, Ct.
Nevada Central R. R. ..... *(See Union Pac.)*
Newburg Junction N. G. R. R. 3 g. 23 m. 3.0 40 cars.
John F. Kidder, *Supt.* ..... Grass Valley, Cal.
Jas. McCormick, *M. M. & C. B.* Grass Valley, Cal.
New Brunswick Ry. 4-8½ g. 194 m. 12 lo. 200 cars.
E. R. Burpee, *Gen. Man.* ..... Gibson, N. B.
Henry Osborn, *Gen. Supt.* ..... Gibson, N. B.
Alfred Seely, *Pur. Agt.* ..... Gibson, N. B.
Jesse Mathews, *M. M.* ..... Gibson, N. B.
T. N. Burpee, *M. C. B.* ..... Gibson, N. B.
New Brunswick & Can. Ry. 4-8½ g. 127 m. 12 lo. 184c.
Henry Osborn, *G. M. & P. A.* St. Andrew's, N. B.
John Stewart, *Supt.* ..... St. Stephen, N. B.
Thos. Armstrong, *M. M.* ..... Hillsdale, N. B.
G. Houlton, *M. C. B.* ..... St. Andrew's, N. B.
New Haven & Derby R. R. 4-8½ g. 13 m. 3 lo. 58 c.
S. S. Quintard, *Supt.* ..... New Haven, Conn.
J. M. Whitlock, *M. M. & C. B.* New Haven, Conn.
New Haven & No'mpton. 4-8½ g. 135 m. 26 lo. 572 c.
O. A. Goodnow, *Supt.* ..... New Haven, Conn.
C. N. Yeamans, *Pur. Agt* ..... New Haven, Ct.
Henry Fox, *M. M.* ..... New Haven, Ct.
John Sweeny, *M. C. B.* ..... New Haven, Ct.
New Jersey & New York Ry. 4-6 g. 43 m. 6 lo. 40 c.
J. D. Hasbrouck, *Gen. Man* Jersey City, N. J.
J. S. Drake, *Supt. & M. M.* ..... Hillsdale, N. J.
L. B. Van Wagonen, *M. C. B.* ..... Hillsdale, N. J.
New Jersey Southern Ry. *(See Central, N. J.)*
New London Northern R. R. *(See Central Vert.)*
New Orleans Pacific Ry. 5 g. 85 m. 10 lo. 200 cars.
H. S. Morse, *Supt.* ..... New Orleans, La.
T. R. Smith, *M. M. & C. B.* ..... New Orleans, La.
N. Y. Central & Hudson River R.R.
4-8½ g. 962 m. 676 lo. 22 539 cars.
J. M. Toucey, *Gen. Supt.* ..... New York, N. Y.
R. C. Moore, *Pur. Agt.* ..... New York, N. Y.
Wm. Buchanan, *Supt. M. P.* ..... New York, N. Y.
L. Garey, *Supt. Car Dept.* ..... New York, N. Y.
N. Y. & Har. Div.: C. M. Bissell, *Supt.* do.
P. McG. Gibson, *M. M.* ..... New York, N. Y.
C. E. Garey, *M. C. B.* ..... Morrisania, N. Y.
Hud. Riv. Div.: C. M. Bissell, *Supt.* N. York, N. Y.
Peter Smith, *M. C. B.* ..... New York, N. Y.
E'n Div.: Zenas C. Priest, *Supt.* ..... Utica, N. Y.
G. B. Van Vorst, *M. M.* ..... West Albany, N. Y.
D. Holt, *M. C. B.* ..... West Albany, N. Y.
W'n Div.: Geo. H. Burrows, *Supt.* Rochester, N. Y.
S. L. White, *M. M.* ..... Syracuse, N. Y.
Amos Gould, *M. M.* ..... Buffalo, N. Y.
E. A. Olmstead, *M. C. B.* ..... E. Buffalo, N. Y.
C. H. Burchard, *M. C. B.* ..... E. Rochester, N. Y.
Ed. Donahy, *M. C. B.* ..... Niagara Falls, N. Y.
N. Y. Chic. & St. L. Ry. 4-8½ g. 239 m. 115 lo. 4,838 c.
Lewis Williams, *Gen. Man.* ..... Cleveland, O.
E. Dwight, *Gen. Supt.* ..... Cleveland, O.
Jno. W. Dougherty, *Pur. Agt.* ..... Cleveland, O.
E. P. Boatman, *Supt. M. P.* ..... Cleveland, O.
Eas'n Div.: G. H. Kimball, *Supt.* ..... Cleveland, O.
E. A. Miller, *M. M.* ..... Conneaut, O.
West'n Div.: E. E. Dwight, *Supt.* ..... Chicago, Ill.
Jas. Eckford, *M. M.* ..... Bellevue, O.
New York City & Northern. 4-8½ g. 52 m. 7 lo. 91 c.
Frank S. Gannon, *Gen. Supt.* High Bridge, N. Y.
Theo. Wheeler, *M. M.* ..... High Bridge, N. Y.
New York, Lake Erie & Western R. R.
4-8½ g. 1,020 m. 568 loco. 30,500 cars.
Robt. Harris, *V. Pr. & Gen. Man.* New York, N. Y.
E. B. Bowen, *Gen. Supt.* ..... New York, N. Y.
J. A. Hardenburg, *Pur. Agt.* ..... New York, N. Y.
F. M. Wilder, *Supt. M. & M.* ..... Susquehanna, Pa.
E'n Div.: E. O. Hill, *Supt.* ..... Jersey City, N. J.
J. H. Vreeland, *M. M.* ..... Jersey City, N. J.
J. B. Mileham, *M. C. B.* ..... Jersey City, N. J.
Del. Div.: W. J. Murphy, *Supt.* Port Jervis, N. Y.
J. Van Vechten, *M. M. & C. B.* Ft. Jervis, N. Y.
Susq. Div.: *Supt.* ..... Elmira, N. Y.
Y. Blackburn, *M. M.* ..... Susquehanna, Pa.
D. B. Goodell, *M. C. B.* ..... Elmira, N. Y.
Buf. & R. Div.: Chas. Neilson, *Supt.* ..... Buffalo, N. Y.
G. B. Ross, *M. M.* ..... Buffalo, N. Y.
M. Wilder, *M. C. B.* ..... Buffalo, N. Y.
B. & S. W. Div.: C. A. Brunn, *Supt.* ..... Do.
W'n Div.: W. B. Coffin, *Supt.* Hornellsville, N. Y.
R. Gunn, *M. M.* ..... Hornellsville, N. Y.
New York, New Haven & Hartford R. R.
4-8½ g. 203 m. 123 lo. 2,768 cars.
E. M. Reed, *V. P. & Gen. Man.* New Haven, Ct.
R. N. Rossi, *Pur. Agt.* ..... New Haven, Ct.
N. Y. & N. H. Div.: W. H. Stevenson, *Supt.* ..... N. Y.
Shore Line Div.:
C. H. Sheard, *Supt.* ..... N. Haven, Ct.
Air Line Div.: O. M. Shepard *Supt.* N. Haven, Ct.
H. Kettendorf, *Supt. M. P.* ..... New Haven, Ct.
Wm. Dunvy, *M. C. B.* ..... New Haven, Ct.
Hart. Div.: C. S. Davidson, *Supt.* ..... Hartford, Ct.
John Henny, Jr., *Supt. M. P. & M. C. B.* ..... do.
New York, Ontario & Western Ry.
4-8½ g. 345 m. 79 lo. 1,539 cars.
Jas. E. Childs, *Gen. Supt.* ..... New York, N. Y.
I. W. Fowler, *Pur. Agt.* ..... Middletown, N. Y.
Edw. Minshull, *M. M. & C. B.* Middletown, N. Y.
Mid. Div.: N. R. Hankins, *Supt.* Middletown, N. Y.
No'n Div.: O. W. Lansher, *Supt.* ..... Norwich, N. Y.
So. Div.: E. Canfield, *Supt.* ..... Tappan, N. Y.
New York, Pennsylvania & Ohio R. R.
4-8½ g. 564 m. 218 lo. 7,304 cars.
J. M. Ferris, *Gen. Man.* ..... Cleveland, Ohio
J. H. Holway, *Pur. Agt.* ..... Cleveland, Ohio.
Wm. Fuller, *Gen. M. M. & C. B.* ..... Cleveland, O.
S. V. Smith, *Asst. Gen. M. C. B.* ..... Kent, Ohio.
E'n div.: A. L. Dunbar, *Supt.* ..... Meadville, Pa.
J. A. Cooper, *M. M.* ..... Meadville, Pa.
D. S. Dockstader, *M. C. Rep.* ..... Meadville, Pa.
J. T. Fosdick, *For. Car Rep.* Salamanca, N. Y.
W'n Div.: J. W. Alsop, *Supt.* ..... Galion, O.
Wm Hill, *M. M.* ..... Galion, O.
J. W. Elmes, *For. Car Rep.* ..... Galion, O.
Geo. Wilson, *For. Car Rep.* ..... Dayton, Ohio.
Mahoʻg Div.: N. F. Wood, *Supt.* ..... Cleveland, O.
N. Wright, *M. M.* ..... Cleveland, O.
C. N. Thorp, *M. C. Rep* ..... Cleveland, O.
New York, Providence & Boston R. R.
4-8½ g. 72 m. 29 lo. 430 cars.
J. B. Gardner, *Supt.* ..... Providence, R. I.
Giles F. Ward, *Pur. Agt.* ..... Stonington, Conn.
J. H. Anderson, *M. M. & C. B.* Providence, R. I.
N. Y., Susquehanna & W'n. 4-9 g. 135 m. 28 lo. 925 c.
H. M. Britton, *Gen. M. & P. A.* New York, N. Y.
W. C. Ennis, *M. M. & C. B.* ..... Wortendyke, N. J.
New York, West Shore & Buffalo Ry.
Chas. Paine, *Gen. Man.* ..... New York, N. Y.
Howard Fry, *Supt. M. M.* ..... New York, N. Y.
P. S. Bemis. *Pur. Agt.* ..... New York, N. Y.
Harry Linn, *M. M.* .....
Walkill Ry. 4-8½ g. H. Graves, *Supt.* Rondout, N. Y.
New York, Woodhaven & Rockaway R. R.
4-8½ g. 26 m. 8 lo. 101 cars.
J. M. Smith, *Supt. & P. Agt.* Hunter's Pt., L. I.
W. B. Turner, *M. M.* ..... Hunter's Point, L. I.
N. Y. & Greenwood Lake Ry. 4-8½ g. 44 m. 8 lo. 53 c.
Stephen Smith, *Supt.* ..... Jersey City, N. J.
J. A. Hardenburg, *Pur. Agt.* ..... New York, N. Y.
G. A. Hill, *M. M.* ..... Pompton, N. J.
N. Y. & Manhattan Beach Ry. 3 g. 23 m. 12 lo. 128 c.
D. C. Corbin, *Man. Dir.* ..... New York, N. Y.
O. Fairhurst *M. M.* ..... Greenpoint, L. I.
New York & Rockaway Beach R. R.
4-8½ g. 463 m. 127 lo. 3,326 cars.
S. M. Felton, Jr., *Gen. Man.* ..... Boston, Mass.
W. W. McKim, *Gen. Pur. Agt.* ..... Boston, Mass.
Ross Kells, *Supt. M. P.* ..... Boston, Ma's.
A. R. Mansfield, *Mech. Eng.* ..... Boston, Mass.
D. F. Wright, *M. M.* ..... Norwood, Mass
H. E. Barker, *Gen. Fore.* ..... Norwood, Mass.
East Div.: C. C. F. Bent, *Supt.* ..... Mattewan, N. Y.
C. D. Moore, *M. M.* ..... Boston, Mass.
Nor. Div.: P. St. M. Andrews, *Supt.* ..... Norwich, Ct.
W. A. Stone, *M. M.* ..... Norwich, Ct.
Prov. Div.: L. W. Palmer, *Supt.* Providence, R. I.
Hfd. Div. : E. Holbrook, *Supt.* ..... Hartford, Ct.
E. M. Humstone, *M. M.* ..... Hartford Ct.
D. F. Andrregg, *Pur. C. Dept.* ..... Hartford, Ct.
Newburg, Dutchess & Conn. R. R. 4-8½ g. 58 miles.
C. J. Kimball, *Gen. Supt.* ..... Matteawan, N. Y.
W. G. Van Buskirk, *M. M. & C. B.* ..... do.
Norfolk Southern. R. R. 4-8½ g. 70 m. 5 lo. 96 c.
M. K. King, *Gen. Man. & Pur. Agt.* Norfolk, Va.
J. S. Whitworth. *M. M. & C. B.* ..... Norfolk, Va.
Norfolk & Western R. R. 5 g. 428 m. 82 lo. 1,220 c.
Henry Fink, *2d V. Pr. & Gen. Man.* Lynchb'g, Va.
W. C. De Armond, *Pur. Agt.* ..... Philadelphia, Pa.
C. Blackwell, *Supt. M. P.* ..... Roanoke, Va.
West'n Div.: Frank Huger, *Supt.* ..... Lynchburg, Va.
F. Sterk, *M. M.* ..... Lynchburg, Va.
East'n Div.: N. M. Osborne, *Supt.* ..... Petersburg, Va.
J. T. Robinett, *M. M. & C. B.* ..... Petersburg, Va.
North-Eastern R. R. of Ga. 5 g. 40 m. 2 lo. 18 cars.
H. R. Bernard, *Supt.* ..... Athens, Ga.
North-Eastern R. R. (S. C.) ..... *(See W'l. & Wel.*
North Pacific Coast R. R. 3 g. 84 m. 12 lo. 320 cars.
David Nye, *Gen. Supt.* ..... San Rafael, Cal.
W. F. Russell, *Pur. Agt* ..... San Francisco, Cal.
J. Fowler, *M. M.* ..... Sancelito Cal.
North Shore ..... Quebec, Can
Northern (N. H.), and Concord & Claremont Rys.
4-8½ g. 173 m. 25 lo. 569 cars.
Geo. E. Todd, *Supt.* ..... Concord, N. H.
M. M. & C. B. & Pur. Agt. ..... do.
Northern (N. J.) R. R. ..... *(See N. Y., L. E. & W'n.)*
Northern Central Ry. ..... *(See Penna. (R.R.)*
North'n Pacific R. R. 4-8½ g. 1,193 m. 104 lo. 3,089 c.
Herman Haupt, *Gen. Man.* ..... St. Paul, Minn.
John H. Ames, *Pur. Agt* ..... St. Paul, Minn
J. T. Odell, *Supt. Trans* ..... St. Paul. Minn
Geo. W. Cushing, *Supt. M. P., M. & R. S.* do.
W. E. Small, *Asst. S. M. P. & M.* ..... do.
St. P. & Minn. Divs.: B. McHugh, *Supt.*, do.
H. J. Small, *A. S. Mach.* (E. D.) Brainerd, Minn.
Frank Rowand, *M. C. B.* ..... Brainerd, Minn.
Dakota Div.: *Supt.* ..... Fargo, Dak.
A. Rupert, *M. M.* ..... Fargo, Dak.
Mo. Div.: D. S. Taylor, *Supt.* ..... Mandan, Dak.
E. F. Doran, *M. M.* ..... Mandan, Dak.
Yell'st'e Div.: S. R. Ainslie, *Supt.* Glendive, Mont
S. L. Bean, *M. M.* ..... Glendive, Mont.
G. S. La Rue, *M. M.* ..... Billings, Mont.
(2) Western Div.: J. M. Buckley, *G. M.*, and
Otis Sprague, *Supt.* ..... New Tacoma, W. T.
H. D. Sanborn, *Pur. Agt.* ..... Portland, Ore.
W. T. Small, *A. S. Mach.* (W. D.) Sprague, W. T.
F. C. Ford, *M. M.* ..... New Tacoma, W. T.
S. Wishart, *M. C. B.* ..... New Tacoma, W. T.
Pend d'Oreˊ Div.:
F. F. Griffin, *Supt.* ..... Ainsworth, W. T.
J. F. Curtis, *M. M.* ..... Sprague, W. T.
Northern & North-W'n Ry. 5-6 & 4-8½ g. 250 lo. 1,033 c.
James Webster, *Supt.* ..... Toronto, Can.
W. C. Schreeber, *Pur. Agt.* ..... Toronto, Can.
P. Clarke, *M. M.* ..... Toronto, Can.

O

Ogdensburg & Lake Champlain R. R.
4-8½ g. 122 m. 33 lo. 1,160 cars.
A. A. Hadlin, *Gen. Man.* ..... Ogdensburg, N. Y.
Abr. Klohs, *Supt. & M. M.* ..... Malone, N. Y.
Ohio Central R. R. 4-8½ g. 230 m. 45 lo. 4,760 cars.
John R. Martin, *Gen. Man* ..... Toledo, O.
T. M. Peeler, *Supt.* ..... Bucyrus, O.
F. W. Stewart, *Pur. Agt* ..... Toledo, O.
J. B. Morgan, *M. M. & C. B.* ..... Bucyrus, O.
Ohio Southern. 4-8½ g. 119 m. 19 lo. 923 cars.
D. R. Ennis, *Supt.* ..... Springfield, O.
H. C. Norton, *Pur. Agt.* ..... Indianapolis, Ind.
W. B. Warren. *M. M.* ..... Springfield, O.
Ohio & Mississippi Ry. 4-9 g. 615 m. 112 lo. 2,501 cars.
W. H. Peabody, *Gen. Man.* ..... Cincinnati, O.
G. E. Atwood, *Pur. Agt* ..... Cincinnati, O.
J. H. Setchel, *Gen. M. M.* ..... Vincennes, Ind.
Cin. Div.: C. B. Cole, *Supt.* ..... Seymour, Ind.
John Thumser, *M. M.* ..... Seymour, Ind.
J. P. Coulter, *M. C. B.* ..... Aurora, Ind.
Arthur Donaldson, *M. M.* ..... Vincennes, Ind.
St. L. & Sp. Div.: C. M. Stanton, *Supt.* St. Louis, Mo.
J. W. Stokes, *M. M.* (Spring. Div.). Pana, Ill.
Louisv. Div.: C. B. Cole, *Supt.* ..... Louisville, Ky.
Oil City & Chicago R. R. 4-9 g. 56 m. 6 lo. 50 cars.
A. Vandiwort, *Supt.* ..... New Castle, Pa.
Oil City & Ridgway R. R. 4-8½ g. 6 m. 1 lo. 43 cars.
A. F. Kent, *Gen. Man.* ..... Oil City, Pa.
Old Colony R. R. 4-8½ g. 463 m. 110 lo. 2,862 cars.
J. H. Eldridge, *Gen. Man.* ..... Boston, Mass.
Main Li. Div.: J. H. French, *Supt.* ..... Boston, Mass.
R. W. Husted, *Pur. Agt.* ..... Boston, Mass.
J. K. Taylor, *M. M.* ..... Boston, Mass.
A. Gleason, *M. C. B.* ..... Boston, Mass.
Cape Cod Div.: C. H. Nye, *Supt.* Hyannis, Mass.
No. Div.: W. Fletcher, *Supt.* ..... Fitchburg, Mass.
George W. Reynolds, *M. M.* ..... Taunton, Mass.
Sam. Stevens, *M. C. B.* ..... Taunton, Mass.
Olean, Bradford & Warren: Bradford: Boston, Mass. and
Kendall & Eldred R. Rs. 3 g. 38 m. 9 lo. 222 cars.
J. W. Watson, *Gen. Supt.* ..... Olean, N. Y.
J. H. Poole, *Pur. Agt.* ..... Buffalo, N. Y.
Charles Turner, *M. M. & C. B.* ..... Olean, N. Y.
Oregon Ry & Nav Co. 4-8½ g. 225 m. 31 lo. 600 cars.
C. H. Prescott, *Manager.* ..... Portland, Ore.
R. E. O'Brien, *Asst. Max. & Act. Supt.* do.
K Von Oterendorf, *Supt.* (O. Div.) S. F'cisco, Cal.
H. S. Rowe, *Supt.* (Ry Div.) ..... Portland, Ore.
J. M. Drake, *Pur. Agt.* ..... Portland, Ore.
C. C. Hobart, *Gen. M. M.* ..... The Dalles, Ore.
Chas. A. Phipps, *M. C. B.* ..... The Dalles, Ore.
N. G. Div.: Wm. Reed, *Man.* ..... Portland, Ore.
James Walch, *M. M.* ..... Portland, Ore.
Oregon & California R. R. 4-8½ g. 200 m. 14 lo. 280 c.
R. Koehler, *Act. Man.* ..... Portland, Ore.
J. Brandt, *Gen. Supt.* ..... Portland, Ore,
A. Brandt, *M. M.* ..... Portland, Ore.
Owensboro & Nashville R. R. 5 g. 44 m. 3 lo. 70 c.
R. S. Bevier, *Act. Supt.* ..... Owensboro, Ky.
H. H. Gabel, *M. M. & C. B.* ..... Owensboro, Ky.

P

Pacific Coast Ry. 3 g. 11 m.
J. M. Fillmore, *Manager.* San Luis Obispo, Cal.
W. H. Masterman, *M. M. & C. B.* ..... do.
Painesville & Youngstown R. R. 3 g. 65 m. 7 lo. 310 c.
R. K. Paige, *Rec. & Man.* ..... Painesville, O.
J. A. Newcome, *Supt.* ..... Painesville, O.
E. B. Baldwin, *M. M.* ..... Painesville O.
Panama R. R. 5 g. 58 m. 14 lo. 534 cars.
H. A. Woods, *Supt.* ..... Aspinwall, U. S. Col.
E. Z. Penfield, *Pur. Agt* ..... New York, N. Y.
W. F. Ray, *M. M.* ..... Aspinwall, U. S. Col.
Parker & Karns City; and
Karns City & Butler R. Rs. 3 g. 27 m. 5 lo. 84 cars.
W. C. Moberly, *Gen. Supt.* ..... Parker City, Pa.
Philip Davies, *M. M.* ..... Parker City, Pa.
Wm. Wolford, *M. C. B.* ..... Parker City, Pa.
Passumpsic R. R. 4-8½ g. 145 m. 28 lo. 980 cars.
E. Raymond, *Pres. & Pur. Agt.* Boston, Mass.
H. E. Folsom, *Supt.* ..... Lyndonville, Vt.
L. L. Barnard, *M. M.* ..... Lyndonville, Vt.
L. F. Woodard, *M. C. B.* ..... Lyndonville, Vt.
Peach Bottom R. R. 3 g. 55 m. 6 lo. 50 cars.
Samuel Dickey, *Gen. Man.* ..... York, Pa.
G. R. Dickey, *Supt. & Pur. Agt.* ..... York, Pa.
F. H. Williams, *M. C. B.* ..... York, Pa.
E. Div.: S. Dickey, *Supt.* ..... Oxford, Pa.
W. P. Kirk, *M. M.* ..... Oxford, Pa.
Pennsylvania Co's (O) Roads.
4-9 g. 2,838 m. 817 lo. 29,432 cars.
Wm. Mullins, *Gen. Pur. Agt.* ..... Pittsburg, Pa.
Joseph Wood, *Supt. M. P.* ..... Fort Wayne, Ind.
(1) Clev. & Pittsb'g R. R. 4-9 g. 224 m. 97 lo. 3,330 c.
R. F. Smith, *Asst. Man.* ..... Cleveland, O.
Philip Reinhard, *Supt.* ..... Youngstown, O.
W. F. Beardsley, *Mast. of Mach.* Wellsville, O.
(2 & 3) Erie & Ashtabula Rds. 178 m. 29 lo. 1,340 c.
Philip Reinhard, *Supt.* ..... Youngstown, O.
J. A. Wood, *Gen. For. Shops.* ..... Erie, Pa.
(4) Indianap. & Vincennes Rd. 117 m. 11 lo. 303 cars.
Jas. J. Frain, *Supt.* ..... Indianapolis, Ind.
(5) Jeffersonville, Madison & Indianapolis R. R.
4-9 g. 217 m. 47 lo. 784 cars.
E. W. McKenna, *Supt.* ..... Louisville, Ky
Wm. Swanston, *M. M.* ..... Jeffersonville, Ind.
Edw. Austin, *M. C. B.* ..... Jeffersonville, Ind.
(6) Ncrtwestern Ohio Ry. 4-9 g. 79 m.
J. S. Morris, *Supt.* ..... Toledo, O.
(7) Pittsburg, Ft. Wayne & Chicago Ry
4-9 g. 468 m. 278 lo. 6,782 cars.
E'n Div.: A. B. Starr, *Supt.* ..... Allegheny, Pa.
Geo. J. Parkin, *M. M.* ..... Allegheny. Pa.
D. M. Pepper, *M. M.* ..... Crestline, O.
W'n Div.: C. D. Law, *Supt.* ..... Ft. Wayne, Ind.
F. D. Casanave, *M. M.* ..... Ft. Wayne, Ind.
A. H. Somers, *Gen. For. Shops* ..... Chicago, Ill.
(8) Pittsburg, Cincinnati & St. Louis Ry.
4-9 g. 1,172 m. 336 lo. 6,482 cars.
Jas. McCrea, *Gen. Supt.* ..... Columbus, O.
R. H. Soule, *Supt. M. P. & M.* ..... Columbus, O.
P. & Col. Div.: E. B. Taylor, *Supt.* Denuison, O.
C. B. Steele, *M. M.* ..... Bennison, O.
A. K. Mansfield, *M. C. B.* ..... Steubenville, O.
Robt. Curtis, *M. M.* ..... Columbus, O.
Thos. Chamberlain, *M. C. B.* ..... Columbus, O.
C. & M. V. Div.: W. F. Black, *Supt.* Zanesville, O.
Leroy Kells, *M. M.* ..... Lancaster, O.
Daniel Jewell, *M. C. B.* ..... Lancaster, O.
Li. Mi. Div.: Ralph Peters, *Supt.* ..... Cincinnati, O.
Leroy Kells, *M. M.* ..... Cincinnati, O.
Jos. Tinsley Howard, *Gen. Foreman.* Cincinnati, O.
Ind. Divs.: J. F. Miller, *Supt.* ..... Richmond, Ind.
W. W. Reynolds, *M. M.* ..... Logansport, Ind.
Chas. H. Starr, *M. C. B.* ..... Logansport, Ind.
W. Arp, *Gen. For.* ..... Indianapolis, Ind.
Chi. Div.: Chas. Watts, *Supt.* Logansport, Ind.
(9) Terre Haute & Indianapolis R. R.
4-9 g. 374 m. 83 lo. 2,868 cars.
Joseph Hill, *Gen. Supt.* ..... St. Louis, Mo.
C. R. Peddle, *P. Agt.* ..... St. Louis, Mo.
Geo. H. Prescott, *S. M. P. & M.* Terre Haute, Ind.
E. D. Lee, *M. M.* ..... Terre Haute, Ind.
Clinton Idler, *M. M.* ..... Indianapolis, Ind.
Chas. Buller, *M. M.* ..... Effingham, Ill.
L. M. Sweet, *M. M.* ..... Logansport, Ind.
Pennsylvar a R. R. Co.'s Roads. (7 Gen. Divs.)
4-6 g. 2,704 m. 1,271 loco. 51,804 cars.
Chas. E. Loch, *Gen. Man.* ..... Philadelphia, Pa.
Enoch Lewis, *Pur. Agt.* ..... Philadelphia, Pa.
John Reilly, *Supt. Trans.* ..... Philadelphia, Pa.
T. N. Ely, *Chief M. P.* (4 Gen. Divs.) Altoona, Pa.
(1) Pennsylvania R. R. Divs.
4-9 g. 1,105 m. 627 lo. 35,583 cars.
S. M. Prevost, *Gen. Supt.* ..... Altoona, Pa.
Frank L. Shepard, *Supt. M. P.*. Altoona, Pa.
G. W. Strattan, *M. M.* ..... Altoona, Pa.
Jno. P. Jones, *Gen. Fore.* ..... Altoona, Pa.
Phila. Div.: Wm. J. Latta, *Supt.* Philadelphia, Pa.
H. D. Garrett, *M. M.* ..... Philadelphia, Pa.
I. W. Van Houten, *Gen. For.* ..... W. Phila. Pa.
Mid. Div.: H. H. Carter, *Supt.* ..... Harrisburg, Pa.
E. L. Caum, *M. M.* ..... Harrisburg, Pa.
Samuel W. Myers, *Gen. For* Harrisburg Pa.
Alt'a Div.: Jas. Reed, *Supt.* ..... Altoona, Pa.
Pitts. Div.: Robert Pitcairn, *Supt.* ..... Pittsburg, Pa.
D. O. Shaver, *M. M.* ..... Pittsburg, Pa.
J. G. Stewart, *Gen. For.* ..... Pittsburg, Pa.
W. Pa. Div.: A. P. Kirtland, *Supt.* Blairsville, Pa.
Wm. H. Myers, *M. M.* ..... Blairsville, Pa.
M. H. Fails, *Gen. For.* ..... Blairsville, Pa.
Fred. Div.: J. B. Hutchinson, *Supt.* ..... York, Pa.
Tyrone Div.: S. Blair, *Supt.* ..... Tyrone, Pa.
Lew. Div.: Wm. M. Phillips, *Supt.* Lewistown, Pa.
Bed. Div.: Thos. A. Roberts, *Supt.* ..... Bedford, Pa.
Monon. Div.: David M. Watt, *Supt.* Hunting'n, Ind.
Wm. Lininger, *M. M.* ..... Pittsburg, Pa.
(2) United R. Rs. of N. J. Divs. 414 m. 257 lo. 4,098 c.
F. Vanderbilt, *Gen. Supt.* ..... Jersey City, N. J.
N. Y. Div.: Robt. E. Pettit, *Supt.* Jersey City, N. J.
H. S. Hayward, *St. M. P.* ..... Jersey City, N. J.
David L. Baker, *Gen. For.* Jersey City, N. J.
L. A. Bosdevex, *M. M.* ..... Jersey City, N. J.
C. F. Bosdevex, *Gen. For.* ..... Jersey City, N. J.
Bely Div.: J. A. Anderson, *Supt.* Jersey City, N. J.
R. McDowell, *M. M.* ..... Lambertville, N. J.
Amboy Div.: I. S. Buckalew, *Supt.* Camden, N. J.
Chas. Hancock, *M. M.* ..... So. Amboy, N. J.
P. S. Bocart, *Gen. For.* ..... So. Amboy, N. J.
(3) West Jersey R. R. 4-9 g. 163 m. 22 lo. 800 cars.
Joseph Crowford, *Supt.* ..... Camden, N. J
W. McAllister, *M. M.* ..... Camden, N. J
C. C. Williams, *Gen. For.* ..... Camden, N. J.
(4) Phila. & Erie R. R. 212 m. 80 lo. 1,488 c.
H. F. Kenney, *Gen. Supt.* ..... Philadelphia, Pa.
S. A. Hodgman, *M. M.* ..... Williamsport, Pa.
W. H. Rungren, *Gen. For.* ..... Wilmington, Del.
Cen. Div.: L. K. Lodge, *Supt.* ..... Philadelphia, Pa.
S. B. Danfield, *M. M. & C. B.* ..... Chester, Pa.
Del. Div.: N. Mills, *Supt.* ..... Philadelphia, Pa.
(5) Phila. & Erie R. R. Divs.: 376 m. 117 lo. 3,481 c.
R. Nelson, *Gen. Supt.* ..... Williamsport, Pa.
A. O. Dayton, *Supt. Mo. Po.* Williamsport, Pa.
E'n. Div.: Thos. Gucker, *Supt.* Williamsport, Pa.
Sun. H. W. Div.: A. Walters, *Supt.*; and
W. F. Beardsley, *M. M.* ..... Sunbury, Pa.
Mid. Div.: E. H. Westfall, *Supt.* ..... Renova, Pa.
Wm. L. Holman, *M. M.* ..... Renova, Pa.
West'n Div.: J. W. Reynolds, *Supt.* ..... Erie, Pa.
W. T. Smith, *M. M.* ..... Erie, Pa.
(6) Northern Central Ry. 4-9 g. 320 m. 152 lo. 6,166 c.
Robert Neilson, *Gen. Supt.* ..... Williamsport, Pa.
A. O. Dayton, *Supt. M. P.* ..... Williamsport, Pa.
A. W. Sumner, *Pur. Agt.* ..... Baltimore, Md
Susq. Div.: A. Walters, *Supt.* ..... Williamsport, Pa.
Sham. Div.: *Supt.* ..... Sunbury, Pa.
Elm. & Can. Divs.: S. Meade, *Supt.* Elmira, N. Y.
Jas. Strode, *M. M.* ..... Elmira, N. Y.
J. C. Dyott, *Gen. For.* ..... Elmira, N. Y.
Baltimore Div.: H. W. Knapp, *Supt.* Baltimore, Md
(7) Balt. & Pot. & Alex. & Fred. 128 m. 20 lo. 356 c
G. C. Wilkins, *Gen. Supt.* ..... Baltimore, Md
A. W. Sumner, *Pur. Agt.* ..... Baltimore, Md
J. M. Wallis, *Supt. Mo. Po.* ..... Baltimore, Md
J. M. Coale, *M. M.* ..... Baltimore, Md
G. W. Demarest, *Gen. For.* ..... Baltimore, Md
Penn. Coal Co.'s R. R. 4-3 g. 67 m. 23 eng. 2,871 c.
J. B. Smith, *Gen. Supt.* ..... Dunmore, Pa.
And. Crane, *M. M.* ..... Dunmore, Pa.
Geo. W. Simpson, *M. C. B.* ..... Dunmore, Pa.
Pennsylvania & Erie R. R.—Early Branch.
C. R. Early, *Gen. Supt.* ..... Ridgeway, Pa.
Pensacola & Perdido R. R. 6 g. 8 m. 5 lo. 73 cars.
B. F. Simmons, *Pr. & Supt.* ..... Pensacola, Fla.
H. W. Simmons, *Pur. Agt.* ..... Pensacola, Fla.
R. G. Nicholl, *M. M. & C. B.* ..... Pensacola, Fla.
Peoria, Decatur & Evansville

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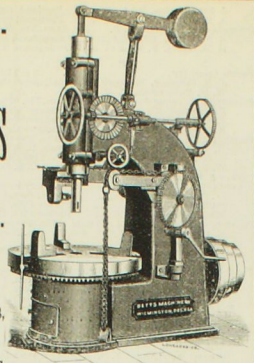

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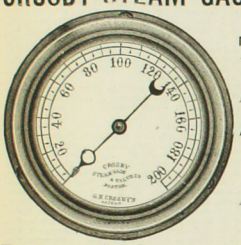

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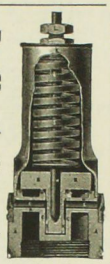

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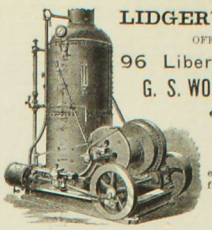

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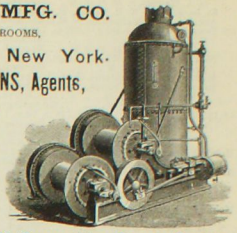

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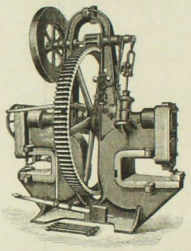
REITER & CO.,
MANUFACTURERS OF ALL KINDS OF CHAINS
BRAKE CHAIN A SPECIALTY.
Twenty-Ninth and Railroad, Pittsburgh, Pa

COMBINED PUNCH AND SHEAR,

BUILT BY



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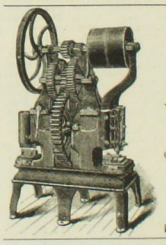
WILMINGTON, DEL.

The annexed cut is taken from our No. 4 size, with Engine attached for driving. Pulleys are in all cases supplied unless engine is especially contracted for. The Shear runs at all times when the belt is on the tight pulley, but the punch end can be stopped and started by a clutch, and for very particular work the hand wheel is used to set the punch to mark before throwing in the clutch. The stripper is adjustable to different kinds of iron. Either punch or Shear supplied separately. FIVE sizes.



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PUNCH AND SHEARS.

Prices from $625 to $1,000.

SIX SIZES MADE.

Warranted to be of greater capacity for the price than any other machine in the market.

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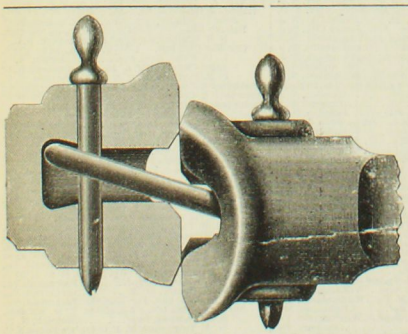

SAFFORD'S SAFETY DRAW-BAR.

"VICTORY OVER MORE THAN 30 CONTESTANTS."

Victory over more than 30 Self-Couplers in the Master Car-Builder's Convention of June, 1876. Also indorsement for safety in coupling by the Yard Masters, in their Convention, June, 1877, and by 300 others who were unable to attend the Convention, and 300 railroad officials who are resident in 26 States, and who admitted superiority over any other yet produced. Try 30 free of royalty, and see for yourself! Pattern free, and no change in timbers or connections. Those made by Wilson, Walker & Co., Pittsburgh, Pa., *will save 200 per cent. in repairs*, and give double life service over *old styles of* wrought iron. About 43,000 in use by 146 railroads. The *saving in repairs* by using *my invention* is from 20 per cent. to 80 per cent. as per *report of many officers.*

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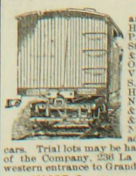
The Perry Safety Freight Car Coupling



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J. H. Perkins, *For. Car Sh.*.... Columbia, S. C.
(1) Columbia & Greenville R. R. 5 g. 297 m. 22 l. 218 c.
J. W. Fry, *Supt.*.... Columbia, S. C.
J. O. Meredith, *For. E. & C. Rep.*.... do.
(4) Virginia Midland Ry. 4-8½ g. 353 m. 41 lo. 631 c.
W. M. S. Dunn, *Eng. & Supt.*Alexandria, Va.
J. E. Waddey, *M. of M.*.... Alexandria, Va.
J. F. Nalls, *M. C. B.*.... Alexandria, Va.
Richmond & Petersburg R.R. 4-8½ g. 25 m. 8 lo. 130 c.
J. R. Kenly, *Supt.*.... Richmond, Va.
John O'Brien, *M. M.*.... Richmond, Va.
Rio Grande R. R. 3-6 g. 22 m. 3 lo. 39 cars.
M. J. Gomila, *Rec. & Gen. Man.* Brownsville, Tex.
G. W. Rendall, *M. M.*.... Brownsville, Tex.
M. Markwood, *M. C. B.*.... Brownsville, Tex.
Rochester & Pittsb'g. R.R. 4-8½ g. 139 m. 11 lo. 612c
Geo. E. Merchant, *Gen. Man.*.... Rochester N. Y.
J. P. Hovey, *M. M.*.... Rochester. N. Y.
Rock Island & Mercer County R. R., and
Rock I'd & Peoria Ry. 4-8½ g. 113 m. 12 lo. 357 c.
R. R. Cable, *F. P. & Gen. Supt.* Rock Island, Ill.
R. I. & P. Ry.; H. B. Sudlow, *Supt. & P. A.* do.
Joseph Elder, *M. M.*.... Peoria, Ill.
R. I. & M. C. Rd.; B. T. Cable, *Supt.* R. K Island, Ill.
J. H. Parks, *M. M.*.... Rock Island, Ill.
Rome (Ga.) R. R. 3 g. 20 m. 2 lo. 13 cars.
Eben Hillyer, *Supt.*.... Rome, Ga.
O. W. Harbin, *M. M. & C. B.*.... Rome, Ga.
Rome, Watertown & Ogdensburg R. R.
4-8½ g. 409 m. 51 lo. 1,400 cars.
E. A. Van Horne, *Gen. Supt.*.... Oswego, N. Y.
Geo. W. B. Cushing, *Pur. Agt.* New York, N. Y.
Geo. H. Haselton, *M. M. & C. B.*.... Oswego, N. Y.
Rumford Falls & Buckfield R. R. 4-8½ g. 29 m. 2 l. 42 c.
O. Hayford, *Supt.*.... Canton, Me.
O. Spaulding, *Pur. Agt.*.... Buckfield, Me.
R. R. Oldham, *M. M.*.... Buckfield, Me.

S

Sabine & East Texas Ry. 4-8½ g. 104 m. 5 lo. 333 c.
R. H. Cousins, *Gen. Supt.*.... Beaumont, Tex.
W. A. Meagher, *M. M.*.... Beaumont, Tex.
Sacramento & Placerville R. R. 4-8½ g. 40 m. 3 lo. 68 c.
J. B. Wright, *Supt. & P. A.*.... Sacramento, Cal.
A. J. Stevens *M. M.*.... Sacramento, Cal.
Benj. Welch, *M. C. B.*.... Sacramento, Cal.
Saginaw Bay & Northw'n R. R. 4-8½ g. 30 miles.
J. Jackson, *Gen. Man.*.... Pinconning, Mich.
F. T. Lillote, *Act. Pur. Agt.*..Pinconning, Mich.
Edward Keeler, *M. M.*.... Pinconning, Mich.
Saginaw Valley & St. Louis R. R. 4-8½ g. 35 m. 41. 64 c
N. W. Merrill, *Supt.*.... Saginaw, Mich.
Allan Bourn, *Pur. Agt.*.... Detroit, Mich.
Geo. C. Watrous, *M. M.*.... Iona, Mich.
San Francisco & No. Pac. 4-8½ g. 112 m. 11 lo. 244 c
Arthur Hughes, *Gen. Man.*..San Francisco, Cal.
H. C. Whiting, *Supt.*.... Petaluma, Cal.
M. C. B..... Donahue, Cal.
Savannah, Florida & W'n Ry. 5 g. 422 m. 50 lo. 695 c.
H. S. Haines, *Gen. Man.*.... Savannah, Ga.
R. G. Fleming, *Supt.*.... Savannah, Ga.
F. S. Pendergast, *Eng. & Asst. Supt.* Savannah, Ga.
A. A. Aveilhé, *Pur. Agt.*.... Savannah, Ga.
James D. Hollister, *M. of Mach.*..Savannah, Ga.
G. M. D. Bilby, *For. Loco. Dept.* Savannah, Ga.
Jos. W. Rowell, *For. Car Dept* Savannah, Ga.
Sav., Griffin & No. Ala. R. R. *Op. by Central (Ga.).*
Schuylkill & Lehigh R. R. 4-8½ g. 43 miles.
Eldredge Dale, *Supt.*.... Reading, Pa.
Scoharie Valley R. R. ..... (*See Middleburg & Sch.*)
Sciotо Valley R. R. 4-8½ g. 131 m. 15 lo. 400 cars.
Geo. Skinner, *Supt.*.... Columbus, O
R. Bromley, *M. M. & P. A.*.. Portsmouth, O.
Seaboard & Roanoke R. R. 4-8½ g. 80 m. 21 lo. 581 c.
E. G. Ghio, *Mast. of Trans.*.. Portsmouth, Va.
M. M. Pendleton, *S. M. P. & M.*Portsmouth, Va.
Shenandoah Valley R. R. 4-8½ g. 143 m. 15 lo. 104 c.
Henry Fink, *Gen. Man.*.... Lynchburg, Va.
J. H. Sands, *Supt.*.... Roanoke, Va.
W. C. De Armond, *Pur. Agt.* Philadelphia, Pa.
Chas. Blackwell, *Supt. of M. P.*.Roanoke, Va.
W. Welch, *M. M.*.... Roanoke, Va.
Shenango & Allegheny R.R. 4-9½ g. 47 m. 6 lo. 156 c.
J. T. Blair, *G. Supt. & Pur. Agt.* Greenville, Pa.
Edw. Richardson, *M. M. & C. B.*..Greenville, Pa.
Shepaug R. R. 4-8½ g. 38 m. 3 lo. 27 cars.
Edwin McNeill, *Supt.*.... Litchfield, Ct.
C. M. Allen, *M. M.*.... Litchfield, Ct.
Ship Is., Ripley & Ky. R. R. 3 g. 25 m. 2 lo. 23 cars.
C. L. Harris, *Supt. & Pur. Agt.*.. Ripley, Miss.
W. H. Phelps, *M. M.*.... Ripley, Miss.
Sioux City & Pacific R. R. 4-8½ g. 427 m. 21 lo. 594 c.
P. E. Hall, *Gen. Man. & P. A.*Cedar Rapids, Ia.
C. M. Lawler, *Gen. Supt.*.... Missouri Valley, Ia.
J. S. Wattles, *Supt.*.... Missouri Valley, Ia.
C. F. McCoy, *Asst. Supt.*.... Blair, Neb.
S. A. Teal, *M. M.*.... Missouri Valley, Ia.
W. H. Ramseyer, *M. C. B.*.. Missouri Valley, Ia.
Sodus Bay & Southern Ry. 4-8½ g. 34 m. 4 lo. 40 c.
E. B. Stuart, *Supt. & Pur. Agt.* Sodus Point, N.Y.
C. H. Hill, *M. C. B.*.... Sodus Point, N. Y.
South Carolina Ry. 5 g. 243 m. 42 lo. 685 cars.
John B. Peck, *Gen. Man.*.... Charleston, S. C.
S. B. Pickens, *Pur. Agt.*.... Charleston, S. C.
P. J. Cochrane, *Mast. of Mach.* Charleston, S. C.
Geo. H. Gramling, *M. C. B.*.. Charleston, S. C.
South-Eastern Ry. 4-8½ g. 260 m. 26 lo. 826 cars.
Bradley Barlow, *Gen. Man.*.... Montreal, Can.
T. A. McKinnon, *Asst. Man.*.. Montreal, Can.
H. A. Alden, *Supt.*.... W. Farnham, P. Q.
A. G. Eastman, *M. M.*.... W. Farnham, P. Q.
South Florida R. R. 3 gauge 40 m. 4 lo. 30 cars.
B. R. Swoope, *Supt. & P. A.*.... Sanford, Fla.
C. C. Haskell, *Pur. Agt.*.... Sanford, Fla.
J. A. Campbell, *M. M.*.... Sanford, Fla.
A. D. Stentiford, *M. C. B.*.... Sanford, Fla.
South Mountain R. R. 4-8½ g. 18 m. 4 lo. 22 c.
H. H. Woodward, *Supt.* Pine G've Furnace, Pa.
South Pacific Coast R. R. 3 g. 81 m. 10 lo. 200 cars.
A. H. Fracker, *Gen. Supt.* San Francisco, Cal.
G. H. Waggoner *Pur. Agt.* San Francisco, Cal.
E. L. Reese, *M. M. & C. B.*.... Newark, Cal.
South-Western R. R. (Ga.) ..... (*See Central of Ga.*)
South-Western Ry. (Ky.) 4-8½ g. 4 m. 1 lo. 38 cars.
J. M. Wilson, *Supt.*.... Harrodsburg, Ky.
J. Tomlinson, *Pur. Agt.*.... Harrodsburg, Ky.
Southern Central R. R. 4-8½ g. 115 m. 16 lo. 447 c.
James G. Knapp, *Supt. & Pur. Ag.* Auburn, N. Y.
Chas. G. Brown, *M. M.*.... Auburn, N. Y.
H. Mooney, *M. C. B.*.... Auburn, N. Y.
Southern Maryland R. R. 4-8½ g. 20 m. 2 lo. 5 c.
Robert Knight, *Supt.*.... Brandywine, Md.
C. R. Joyce, *M. M.*.... Brandywine, Md.
Southern Pacific R. R. 4-8½ g. 198 m. 30 lo. 728 c.
Northern Div. (*For other Divs. see Cen. Pac.*)
A. C. Bassett, *Supt.*.... San Francisco, Cal.
R. K. Watson, *Pur. Agt.*.... Sacramento, Cal.
J. T. Wilson, *M. M.*.... San Francisco, Cal.
F. N. Belliss, *M. C. B.*.... San Francisco, Cal.
Springfield, Effingham & So. R. and Bloomfield Ry.
3 g. 80 m.
W. C. Lyon, *Gen. Man. & Pur. Agt.* Robinson, Ill.
J. R. Pickering, *M. M. & C. B.*.. Effingham, Ill.
Spring Hill & Parrsboro Ry. 4-8½ g. 32 m. 1 lo. 64 c.
A. A. Killam, *Gen. Man.*.... Parrsboro, N. S.
K. McKinnon, *M. M.*.... Parrsboro, N. S.
St. Croix & Penobscot R. R. 4-8½ g. 22 m. 4 lo. 105 c.
S. W. Haycock, *Supt. & Pur. Agt.*.. Calais, Me.
G. H. Corsen, *M. M.*.... Milltown, Me.
H. C. Tucker, *M. C. B.*.... Milltown, Me.
St. John & Maine Ry. 4-8½ g. 92 m. 9 lo. 146 cars.
H. D. McLeod, *Supt. & P. Agt.*.. St. John, N. B.
Andrew Davis, *M. M.*.... St. John, N. B.
St. John's Ry. 4-8½ g. 14½ m. 2 lo. 24 cars.
R. McLaughlin, *Pr. & Supt.*..Jacksonville, Fla.
George Stern, *M. of Mach.*.... Tocoi, Fla.
St. Johnsbury & Lake Champ. 4-8½ g. 120 m. 10 lo. 267 c.
A. B. Jewett, *Supt. & P. A.*.. St. Johnsbury, Vt.
Geo. H. Hoxie, *M. & C. B.*St. Johnsbury, Vt.
St. Joseph & Des Moines R. R. (*See K. C., St. J. & C. B.*)
St. Lawrence & Ottawa Ry. 4-8½ g. 50 m. 10 l. 140 c.
Archer Baker, *Gen. Supt.*.... Montreal, Ont.
R. Blackwell, *Mech. Supt.*.... Montreal, Ont.
St. Louis, Alton & Terre Haute R. R.
Main Line. (*See Ind. & St. L. Div.; Ohio Ry.*)
St. Louis & Cairo Div.: 4-8½ g. 137 m. 17 lo. 778 c.
G. W. Parker, *Gen. Man.*.... St. Louis, Mo.
J. L. Hinckley, *Supt.*.... Belleville, Ill.
A. M. De Clerq, *M. M.*.... St. Louis, Mo.
St. Louis Bridge Co. and Tunnel R. R.
4-8½ g. 27 m. 18 lo. 11 cars.
Wm. Taussig, *Gen. Man.*.... St. Louis, Mo.
A. W. Dickinson, *Supt.*.... St. Louis, Mo.
J. E. Williams, Jr., *Pur. Agt.*.. St. Louis, Mo.
H. M. Smith, *M. M.*.... St. Louis, Mo.
St. Louis Coal R. R. 4-8½ g. 28 m. 1 lo. 78 cars.
Jas. Prentice, *Supt.*.... Carbondale, Ill.
Jas. C. Bryden, *Pur. Agt.*.... St. Louis, Mo.
St. Louis, Florissant & Wichita R. R. 4-8½ g. 138 miles.
F. Tiernan, *F. P. & Gen. Man.*.Fort Scott, Kan.
J. W. Miller, *Gen. Supt.*.... Fort Scott, Kan.
Henry Bender, *M. M.*.... Ft. Scott, Kan.
A. A. Tiddell, *M. C. B.*.... Ft. Scott, Kan.
St. L., Hannibal & Keokuk. 4-8½ g. 85 m. 5 lo. 65 c.
W. H. Dickinson, *Supt.*.... Hannibal, Mo.
Geo. Douglass, *Pur. Agt.*.... Hannibal, Mo.
St. Louis, Iron Mt. & So'n Ry. (*See Mo. Pacific Ry.*)
St. L., Keokuk & No. W'n. 4-8½ g. 187 m. 14 lo. 315 c.
R. Law, *Gen. Supt.*.... Keokuk, Ia.
G. B. Harris, *Pur. Agt.*.... Chicago, Ill.
Wm. H. Bartlett, *M. M.*.... Keokuk, Ia.
St. L., Salem & Little Rock. 4-9 g. 69 m. 5 lo. 103 c
H. A. Crawford, *V. Pr. & P. A.*.. St. Louis, Mo.
E. B. Sankey, *Supt.*.... Salem, Mo.
Thomas Everson, *M. M.*.... Steelville, Mo.
J. W. Houston, *M. C. B.*.... Steelville, Mo.
St. L., Van. & T. H. (*See T. H. & I. Div. of Penna. Co.*)
St. Louis & Cairo R. R. 3 g. 152 m. 22 lo. 896 cars.
Chas. Hamilton, *Gen. Supt.*.... St. Louis, Mo.
R. M. Pringle, *M. M.*.... St. Louis, Mo.
St. L. & San Fran. Ry. 4-8½ g. 854 m. 80 lo. 2,700 c.
C. W. Rogers, *V. P. & Gen. Man.*St. Louis, Mo.
D. H. Nichols, *Asst. Trav. No.* Springfield, Mo.
A. G. Thompson, *Pur. Agt.*.... St. Louis, Mo.
M. Kearney, *M. M. & C. B. No.* Springfield, Mo.
Mo. & Ark. Div.: W. A. Thoms, *Supt.* ..... do.
Kan. Div.: J. R. Wentworth, *Supt.* Neodesha, Kan.
St. Martin's & Upham Ry. 4-8½ g. 30 m. 2 lo. 2 cars.
A. E. Killam, *Manager*.... St. Martin s. N. B.
St. Paul, Minneapolis & Manitoba Ry.
4-8½ g. 1,125 m. 108 lo. 4,331 cars.
A. Manvel, *Gen. Man.*.... St. Paul, Minn.
S. R. Stimson, *Gen. Supt.*.... St. Paul, Minn.
E. B. Wakeman, *Asst. Gen. Supt.* St. Paul, Minn.
J. C. Morrison, *Pur. Agt.*.... St. Paul, Minn.
H. Middleton, *M. M. & C. B.*.. St. Paul, Minn.
Breck Div.: C. H. Smithe, *Supt.*.. St. Paul, Minn.
F. F. Killam, *Manager*.... St. Paul, Minn.
No'n Div.: D. K. Smith, *Supt.*.. Crookston, Minn.
St. Paul & Duluth R. R. 4-8½ g. 196 m. 29 lo. 580 c.
H. P. Broed, *Asst. Gen. Supt.*.. St. Paul, Minn.
J. G. Callahan, *Pur. Agt.*.... St. Paul, Minn.
W. McFarland, *M. M.*.... St. Paul, Minn.
John Hill, *M. C. B.*.... St. Paul, Minn.
Sterling Mountain Ry. 6 g. 8 m. 2 lo. 145 cars.
C. Miscmer, *Supt.*.... Sloatsburg, N. Y.
Syracuse, Binghamton & N. Y., R. R. (*See D. L. & W.*)
Syracuse, Chenago & N. Y. 4-8½ g. 44 m. 4 lo. 90 c.
Albert Allen, *Supt. & P. A.*.... Syracuse, N. Y.
George W. West, *M. M.*.... Syracuse, N. Y.
Wm. J. McMichael, *M. C. B.*.. Syracuse, N. Y.
Syracuse, Geneva & Corning; Corning, Cowanesque & Antrim R. Rs. 4-8½ g. 121 m. 28 lo. 1,044 c.
A. H. Gorton, *Supt.*.... Corning, N. Y.
W. E. Gorton, *Asst. Supt.*.... Corning, N. Y.
Andrew Beers, *Pur. Agt.*.... Corning, N. Y.
O. C. Patchell, *M. M.*.... Corning, N. Y.
C. J. Butler, *M. C. B.*.... Corning, N. Y.

T

Terre Haute & So.-Eastern Ry. 4-9 g. 40 miles.
Albert Atherton, *Supt.*.... Terre Haute, Ind.
Texas-Mexican; and Mexican National Rys.
3 g. 333 m. 28 lo. 600 cars.
G. C. Gardner, *Gen. Man.*.... New York, N. Y.
R. C. Peebles, *Supt.*.... Mexico, Mex.
J. Dougherty, *Pur. Agt.*.... New York, N. Y.
No. Div.: F. A. Lister, *G. M.*.. Corpus Christi, Tex.
P. J. Milan, *M. M. & C. B.*.... do.
Mex. Nat. Ry.: J. C. Monroe, *M. M.* Mexico, Mex.
Jno. Sculfen, *Gen. Man.*.... Mexico, Mex.
Texas Western Ry. 3 g. 42 m. 2 lo. 34 cars.
E. L. Herbst, *Gen. Man.*.... Houston, Tex.
J. W. Goodwin, *Supt.*.... Houston, Tex.
T. F. Glispin, *M. M.*.... Houston, Tex.
Texas & New Orleans; Louisiana W'n R. Rs.
4-8½ g. 317 m. 32 lo. 900 c.
A. N. Towne, *Gen. Man.*.... Houston, Tex.
P. B. Watson, *Pur. Agt.*.... Houston, Tex.
C. A. Burton, *Supt.*.... Houston, Tex.
D. C. Smith, *M. M.*.... Houston, Tex.
J. M. Mather, *M. C. B.*.... Houston, Tex.
Texas & Pacific. (*See So. Pac. Ry.*)
Texas & St. Louis Ry. 3 g. 304 m. 19 lo. 338 cars.
G. W. Ristine, *Gen. Man.*.... St. Louis, Mo.
J. B. Van Dyne, *Gen. Supt.*.... Tyler, Tex.
F. W. Paramore, *Pur. Agt.*.... St. Louis, Mo.
L. B. Fish, *Pur. Agt.*.... Tyler, Texas.
W. J. Lewis, *M. M. & C. B.*.... Tyler, Tex.
Tioga and Chadra Railroad Line R. Rs.
4-8½ and 6 g. 54 m. 17 lo. 953 cars.
L. H. Shattuck, *Supt.*.... Roseburg, Pa.
J. A. Hardenburg, *Pur. Agt.*.. New York, N. Y.
Pere Bonny, *M. M.*.... Blossburg, Pa.
D. H. Stratton, *M. C. B.*.... Blossburg, Pa.
Toledo, Ann Arbor & Gr. Tr. Ry. 4-8½ g. 84 m. 9 lo. 150 c.
J. M. Ashley, *Gen. Man.*.... Ann Arbor, Mich.
H. W. Ashley, *Supt. & Pur. Agt.* do.
C. C. Dodge, *M. M.*.... Ann Arbor, Mich.
Toledo, Cin. & St. Louis R. R. 3 g. 465 m. 63 lo. 2,200 c.
T. A. Phillips, *Gen. Man.*.... Toledo, O.
J. H. Wilson, *Pur. Agt.*.... Toledo, O
L. James, *Supt. Mach.*.... Toledo, O.
Thos. Robertson, *M. M.*.... Delphos, O.
Toledo Div.: W. S. Moffatt, *Supt.*; and
J. G. Clifford, *M. M.*.... Delphos, O.
C. H. Mead, *Gen. M. C. B.*.... Delphos, O.
S. E'n & Dayton Div.: D. T. Bacon, *Supt.* Dayton, O.
L. Parisoe, *M. M.*.... Dayton, O.
Tonawanda Valley & Cuba and Bradford, Eldred & Cuba R. Rs. 3g. 19 m. 1 lo. 13 cars.
L. G. Wiggins, *Supt.*.... Bradford. Pa.
Toronto, Grey & Bruce Ry. 4-8½ g. 191 m. 20 lo. 446 c.
Edmund Wragge, *Gen. Man.*.... Toronto, Can.
W. Watson, *Pur. Agt.*.... Toronto, Can.
David Preston, *M. M.*.... Toronto, Can.
Troy & Boston R. R. 4-8½ g. 48 m. 20 lo. 484 cars.
D. Robinson, *Pres. & Pur. Agt.*.. Troy, N. Y.
Joseph Crandell, *Supt.*.... Troy, N. Y.
Z. B. Davis, *M. M.*.... Troy, N. Y.
R. V. Coon, *M. C. B.*.... Troy, N. Y.
Tuckerton R. R. 4-8½ g. 31 m. 2 lo. 28 cars.
J. J. Pharo, *Supt.*.... Tuckerton, N. J.

U

Ulster & Delaware R. R. 4-8½ g. 74 m. 10 lo. 214 cars.
Jas. H. Jones, *Supt.*.... Rondout, N. Y.
Joseph Rush, *M. M.*.... Rondout, N. Y.
John H. Decker, *M. C. B.*.... Rondout, N. Y.
Union Pacific Ry. (5 Gen. Divs.)
3 g. 4-8½ g. 4,280 m. 310 lo. 10,550 cars.
S. H. H. Clark, *Gen. Man.*.... Omaha, Neb.
Thos. L. Kimball, *Asst. Gen. Man.* Omaha, Neb.
M. H. Goble, *Pur. Agt.*.... Omaha, Neb.
I. H. Congdon, *S. M. P. & C. D.*.. Omaha, Neb.
Jno. Mackenzie, *Asst. do.*.... Omaha, Neb.
John Wilson, *M. C.*.... Omaha, Neb.
(1) Neb. Div.: P. J. Nichols, *Gen. Supt.*..Omaha, Neb.
E. Div.: C. B. Havens, *Supt.*.... Omaha, N. B.
R. McConnell, *M. M.*.... Omaha, Neb.
A. M. Collett, *M. C. B.*.... Omaha, Neb.
St. J. & W. Div.: L. D. Tuthill, *Supt.* St. Joseph, Mo.
E. Sleppy, *M. M.*.... St. Joseph, Mo.
Moun. Div.: W. A. Deuel, *Supt.*.. Cheyenne, W.T.
J. H. McConnell, *M. M.*.... N. Platte, Neb.
R. McNaught, *M. M.*.... Cheyenne, W. T.
(2) Wy. Div.: E. Dickenson, *Gen. Supt.*..Laramie, W. T.
Laramie Div.: E. Dickenson, *Gen. Supt.* do.
T. E. Lewis, *M. M.*.... Laramie, W. T.
T. A. Davis, *M. M.*.... Rawlins, W. T.
Wes. Div.: C. E. Wurtelle, *Supt.* Evanston, W. T.
Geo. F. Chapman, *M. M.*.... Evanston, W. T.
(3) Idaho Div.: W. B. Doddridge, *Gen. Supt.* Ogden, U.
Og. S. L. Div.:
H. Blickensderfer, *Supt.*.... Pocatello, Id.
W. H. Lewis, *M. M.*.... Montpellier, Id.
S. L. & W. Div.:
W. W. Ritter, *Supt.*.... S. Lake City, Utah.
U. & N. Div.:
R. Blickensdorfer, *Supt.*.... Pocatello, Id.
R. Croft, *M. M.*.... Logan, Utah.
F. Reardon, *M. M.*.... Eagle Rock, Id.
(4) Col. Cent. Div.: A. A. Egbert, *Gen. Supt.* Denver, Col.
C. C. Div.: P. Toughy, *Supt.*.... Denver, Col.
F. Meirtsheimer, *M. M.*.... Denver, Col.
So. Park Div.: G. W. Evans, *A. Supt.* Como, Col.
P. Meirtsheimer, *M. M.*.... Denver, Col.
(5) Kan. Div.: F. T. Smith, *G. Supt.*..Kansas City, Mo.
K. Val. Div.: J. O. Brinkerhoff, *Supt.* Kan. C'y, Mo.
Jas. Mackenzie, *M. M.*.... Armstrong, Kan.
Kan. Cent. Div.:
N. P. Kelley, *Supt.*.... Leavenworth, Kan.
Smo. Hill Div.:
O. H. Dorance, *Supt.*.... Wallace, Kan.
J. B. Dailey, *M. M.*.... Ellis, Kan.
United States Rolling Stock Co. ..... 23 lo. 4,834 cars.
A. Hegewisch, *Pres.*.... New York, N. Y.
C. F. Jauriet, *Gen. M. M.*.... Chicago, Ill
W. H. Chadock, *Pur. Agt.*.... Chicago, Ill
Utah Central Ry. 4-8½ g. 280 m.
John Sharp, *Gen. Supt.*.. Salt Lake City, Utah
S. H. Hill, *Pur. Agt.*.... Salt Lake City, Utah
W. B. Armstrong, *M. M.*.. Salt Lake City, Utah
Peter Reid, *M. C. B.*.... Salt Lake City, Utah
Utah & Nevada Ry. 3 g. 37 m
W. W. Ritter, *Gen. Man.*.. Salt Lake City, Utah
Robert Anderson, *M. M.*.. Salt Lake City, Utah
Utah & Pleasant Valley Ry. 60 m
G. M. Young, *Man.*.... Salt Lake City, Utah
Utica, Ithaca & Elmira Ry. 4-8½ g. 120 m. 11 lo. 375 c.
C. R. Fitch, *Supt.*.... Elmira, N. Y.
Geo. W. Cleveland, *M. M.*.... Breesport, N. Y.
C. J. Hyatt, *M. of M. & C. B.*.. Breesport, N. Y.
Utica, & Black Riv. R. R. 4-8½ g. 180 m. 22 lo. 329 c
J. F. Maynard, *Gen. Supt. & P. A.*.Utica, N. Y.
John Bliss, *M. M.*.... Utica, N. Y.
David ames, *M. C. B.*.... Utica, N. Y.

V

Vaca Vall. & Clear Lake R. R. 4-8½ g. 30 m. 2 lo. 19 c.
G. B. Stevenson, *Gen. Supt.*.... Vacaville, Cal.
Valley Ry. 4-8½ g. 50 m. 10 lo. 317 cars.
J. E. Tusk, *Supt. & P. Agt.*.... Cleveland, O.
Chas. Blanchard, *M. C. B.*.... Cleveland, O.
Vernon, Greensburg & Rushville R. R.
Horace Scott, *V. Pres.*.... Greensburg, Ind.
Virginia Midland Ry. ..... (*See Rich. & Dan.*)
Virginia & Truckee R. R. 4-8½ g. 54 m. 7 lo. 375 c.
Carson & Colorado R. R. 3 g. 158 m. 4 lo. 76 c.
H. M. Yerington, *Gen. Supt.*.... Carson, Nev.
R. J. Laws, *Supt.* (C. & Col.).... Carson, Nev.
C. P. Mason, *Pur. Agt.*.... Carson, Nev.
I. N. Fording, *M. M.*.... Carson, Nev.
B. F. Lyon, *M. C. B.*.... Carson, Nev.

W

Wabash, Chester & W'n R. R. 4-8½ g. 42 m. 2 lo. 32 c
J. J. Hinckley, *Gen. Supt.*.... Chester, Ill
Wabash, St. Louis & Pacific Ry. (3 Gen. Divs.)
4-8½ g. 3,241 m. 598 lo. 17,230 cars.
John C. Gault, *2d V. P.*.... St. Louis, Mo.
Robert Andrews, *Gen. Supt.*.. St. Louis, Mo.
W. S. Lincoln, *Pur. Agt.*.... St. Louis, Mo.
Jacob Reed's Sons, *Gen. M. M.*.. Springfield, Ill.
U. H. Kohler, *Gen. M. C. B.*.. Toledo, O.
(1) Eas'n Div.: J. B. Barnes, *M. M.* Fort Wayne, Ind.
Oh. & Ind. Div.: G. W. Stevens, *Supt.* Ft. Wayne, Ind.
Peru Div.: E. C. Murphy, *Supt.*.... Peru, Ind.
John McKenna, *M. M.*.... Peru, Ind.
Cairo Div.: D. G. Moore, *Supt.*.... Carmi, Ill
W. S. Morris, *M. M.*.... Carmi, Ill
(2) Middle Div.: R. M. Hemphill, *M. C. B.* Havana, Ill.
Ill. Div.: H. F. Clark, *Supt.*.... Springfield, Ill.
B. B. Rose, *M. C. B.*.... Decatur, Ill.
Chicago Div.: E. N. Armstrong, *Supt.* Chicago, Ill.
Peoria Div.: F. Tomkins, *Supt.*.... Peoria, Ill
Rant'l Div.: B. F. Mathias, *Supt.*.. Rantoul, Ill
J. McCarthy, *M. M.*.... Rantoul, Ill
(3) Western Div.: W. H. Selby, *M. M.*.. Moberly, Mo.
C. S. Buck, *M. C. B.*.... Moberly, Mo.
Missouri Div.: R. S. Miner, *Supt.*.. Moberly, Mo.
C. B. & Q. Div.: J. W. Blanchard, *Supt.*; and
J. S. Hazen, *M. C. B.*.... Stanberry, Mo.
Quincy Div.: F. D. Schermerhorn, *S. Agent*, Ill.
Iowa Div.: Brewer, *Supt.*.... Keokuk, Ia.
D. Moin. Div.: H. B. Skeels, *Supt.*.. Des Moines, Ia
Walla Walla & Columbia Riv. R. R. ..... (*See Ry.*)
Walkill Ry. ..... (*See N. Y., West. Sh. & B.*)
Washington & Western R. R. 4-8½ g. 52 m. 5 lo. 83 c.
H. McLean, *Gen. Supt.*.... Alexandria, Va.
Edward Dunn, *M. M.*.... Alexandria, Va.
John Harrison, *M. C. B.*.... Alexandria, Va.
Waynesburg & Washington Rd. 3 g. 28 m. 3 lo. 15 c.
C. E. Bower, *Supt.*.... Waynesburg, Pa.
A. M. Kline, *M. C. B.*.... Waynesburg, Pa.
Welland Ry. 4-8½ g. 25 m. 5 lo. 147 cars.
William Pay, *Supt.*.... St. Catharines, Ont.
Jas. Taylor, *M. M.*.... St. Catharines, Ont.
Wm. H. Pay *M. C. B.*.... St. Catharines, Ont.
West End Narrow Gauge Ry. 3 g. 16 m.
Rolla Wells, *Supt.*.... St. Louis, Mo.
M. M. Hodgman, *M. M.*.... Florissant, Mo.
West Feliciana R. R. 4-8½ g. 27 m. 2 lo. 22 cars.
J. B. McGehee, *Pr. & Gen. Supt.* Bayou Sara, La.
J. A. Tilton, *M. M. & C. B.*.... Bayou Sara, La.
West Virginia, Central & Pitts'g Ry. 13 m. 3 lo. 19 c.
W. E. Porter, *Gen. Supt.*.. Piedmont, W. Va.
W. T. Blackiston, *Pur. Agt.*.. Piedmont, W. Va.
E. W. Lippencott, *M. M. & C. B.* Piedmont.
Western R. R. (of Ala.) 5 g. 88 m. 15 lo. 270 cars.
Atlanta & W. Point Rd. 5 g. 87 m. 14 lo. 206 c.
Cecil Gabbett, *Gen. Man. & Supt.*.. Mont., Ala.
C. D. Wall, *M. M.*.... Montgomery, Ala.
F. M. Wade, *M. C. B.*.... Montgomery, Ala.
Western Counties' Ry. 4-8½ g. 67 m. 8 lo. 137 cars.
J. Brignoli, *Supt.*.... Yanceyville, N. C.
Western Maryland R. R. 4-8½ g. 157 m. 16 lo. 394 c
J. M. Hood, *Pr. & Gen. Man.*.. Baltimore, M. I.
R. J. Adair, *Pur. Agt.*.... Baltimore, Md.
David Holtz, *Mast. of Mach.*.Union Bridge, Md.
J. H. Nussear, *M. C. B.*.... Union Bridge, Md.
Western No. Carolina R. R. 5 g. 155 m. 6 lo. 96 c.
T. E. McBee, *Supt.*.... Salisbury, N. C.
Jos. P. Minetree, *Pur. Agt.*.... Richmond, Va.
G. W. Gaston, *M. M.*.... Salisbury, N. C.
Western & Atlantic R. R. 5 g. 138 m. 48 lo. 952 c.
R. A. Anderson, *Gen. Supt.*.... Atlanta, Ga.
A. B. Bostwick, *Asst. Supt.*.... Atlanta, Ga.
W. R. Webster, *Pur. Agt.*.... Atlanta, Ga.
John H. Flynn, *M. M. & C. B.*.. Atlanta, Ga.
Wheeling & Lake Erie R. Ry. 108 miles.
M. D. Woodford, *Gen. Supt.*.... Toledo, O.
O. P. Dunbar, *Gen. M. M.*.... Norwalk, O.
White Water R. R. *Op. by Cin. & Ind. R. R.* (*See Ry.*)
Wilmington & No'n R. R. 4-8½ g. 77 m. 13 lo. 148 c.
J. H. Thompson, *Supt. & P. A.* Coatesville, Pa.
George Rommel, *M. M.*.... Coatesville, Pa.
Alex. Maitland, *M. C. B.*.... Coatesville, Pa.
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5 g. 593 miles 70 locomotives 1,120 cars.
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J. F. Divine, *Gen. Supt.*.... Wilmington, N. C
John Bissett, *M. M.*.... Wilmington, N. C.
W. H. Day, *M. C. B.*.... Florence, S. C.
C. R. Clowe, *M. C. B.* (W. & W.).Wilmington, N. C
Windsor & Annapolis Ry. 4-8½ g. 130 m. 10 lo. 156 c.
P. Innes, *Gen. Man.*.... Kentville, N. S.
Wm. Yould, *M. M.*.... Kentville, N. S.
Wm. Grierson, *M. C. B.*.... Kentville, N. S.
Wisconsin Central R. R. 4-8½ g. 480 m. s9 lo. 1,608 c.
F. N. Finney, *Gen. Man.*.... Milwaukee, Wis.
G. Campbell, *Pur. Agt.*.... Milwaukee, Wis.
W. A. Short, *Supt. M. P. & M.*.. Stevens Pt., Wis.
Mil. & E'n Divs.: A. A. Allen, *S.*.. Milwaukee, Wis.
Wis., Minn. & M. & N. Div.:
W. E. Carroll, *Supt.*.... Stevens Point, Wis.
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4-8½ g. 95 m. 20 lo. 505 cars.
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G. W. Hurlburt, *Supt.*.... Worcester, Mass.
John G. Brady, *M. M. & C. B.* Worcester, Mass.
Worcester & Shrewsbury R. R. 3 g. 3 miles.
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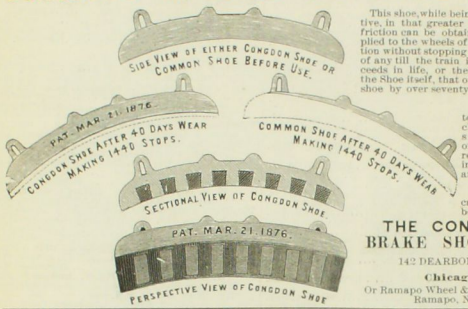

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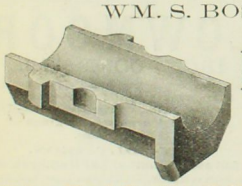

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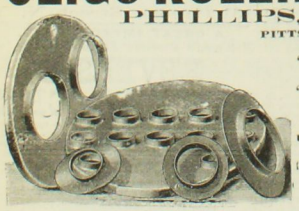

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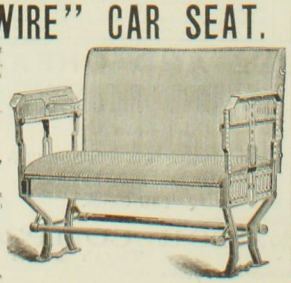

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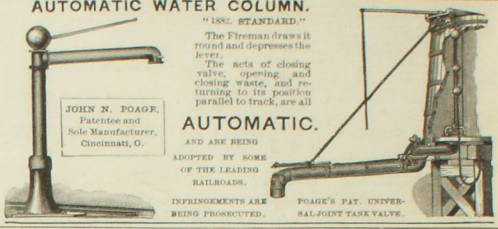

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H. B. Plant, Pres't Savannah, Florida & Western R. R., and Southern Express Co., N. Y.
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James McCrea, Man. P. C. & St. L. Ry., Columbus.
W. C. Quincy, Gen'l Man., P. & L. E. R. R., Pittsburgh.
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ORMSBY'S PATENT SASH-HOLDER AND LOCK.

This invention is designed for railroad car windows, and consists of a concealed bolt in the right-hand lower edge of the sash, intersecting with a ratchet in the window-frame. The left-hand edge of the sash has a flat brass spring with a friction roller, which throws the sash to the opposite side and holds it tight. By pressing the thumb-piece hard to the left, the *bottom of the sash* will move in the same direction, and the window can thus be raised or lowered at will to any desired height.

This invention has been applied to cars on the following railroads:

Boston and Albany, Old Colony, N. Y. Manhattan Elevated, Baltimore & Ohio, New London Northern, Hudson River Day Line and many others.
Boston & Providence, Eastern, Michigan Central, Intercolonial & N. Scotia, Pullman Pal. Car Co.,
Boston, Lowell & Concord, N. Y. Cen. & Hudson River, Chicago & Alton, Great Western, Detroit, Lansing & No.,

THE ADVANTAGES OF THIS FIXTURE ARE:

1st. The window can be easily operated with one hand.
2d. When open, it will remain where it is placed, without danger of falling, thus avoiding injury to fingers and arms.
3d. A large or small quantity of fresh air can be admitted at the will of the passenger.
4th. It prevents the window from rattling.
5th. The extra play of the sash in the frame affords ample opportunity for it to swell in damp weather, and still be easily raised.
6th. The handle is also a LOCK, which is self-locking whenever the window is closed, and is unlocked in the operation of opening the window.
7th. It will outwear any other fixture.

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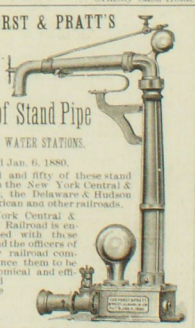
Frost Proof Stand Pipe

FOR RAILWAY WATER STATIONS.



Patented Jan. 6, 1880.

One hundred and fifty of these stand pipes in use on the New York Central & Hudson River, the Delaware & Hudson Canal, the Mexican and other railroads.

The New York Central & Hudson River Railroad is entirely equipped with these stand pipes, and the officers of this and other railroad companies pronounce them to be the most economical and efficient stand pipes in the market.

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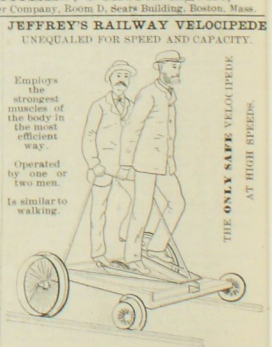

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Operated by one or two men.

Is similar to walking.

For particulars, address T. B. JEFFREY, 40 So. Canal St., Chicago, Ill.

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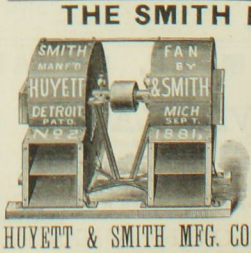

It takes only half the power to operate it that any other make of fan of the same capacity requires.

THE BLAST WHEEL IS ONE-THIRD less in width and diameter than any other fan of same capacity.

The construction of the case or shell of this fan is entirely different from anything heretofore made. The PECULIAR SKEW WINGS or blades of blast wheel with CUT-OFF ON ENDS are MUCH MORE EFFECTIVE than the STRAIGHT, FLAT BLADES in use in all other exhaust fans.

HUYETT & SMITH MFG. CO., Patentees and Sole Manufacturers

P. O. Box 466. DETROIT, MICH.

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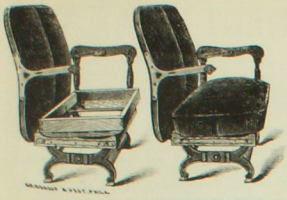

Mason's Patent Improved Car Seat,

THE PENNSVLVANIA.

NO BREAKING BY REVERSING RAPIDLY. HUNDREDS OF COACHES SEATED WITH THIS CAR SEAT.

Is the Penna R. R. Standard Eastlake seat, and used extensively by the Lehigh Valley, C., B. & Quincy, Savannah, Florida & Western, and many other railroads. It meets the long needed want of a reversible seat that elevates the cushion in front, and also makes it wider. Without hinges, cams, or any other mechanical appliance. Works automatically. Address

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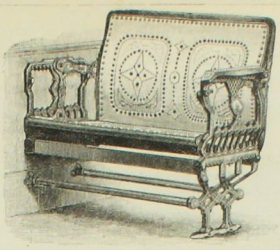
Lock-Box 144. ALTOONA, PA.



Gardner's New Reversible Car Seat, No. 8,

Patented December 6th, 1881.

☞ *Please send for Descriptive Circular giving full particulars and prices.*

As the back reverses, it raises the front of the seat so as to prevent the passenger from slipping off of the seat, and removes the objection made to this kind of seat heretofore.

The large orders already received from the N. Y. C. & H. R. R. R. and other prominent companies for our No. 8 Seat is the best guarantee of its merit.

Made with perforated Veneer, Leather, Plush and Rattan Seats and Backs, which are interchangeable; one kind of seat can be used in the Summer and the other in the Winter.

GARDNER & CO.,

Patentees and Manufacturers of Car Seats, Car Ceilings, Depot Seats, &c.,

183 CANAL ST., NEW YORK CITY.

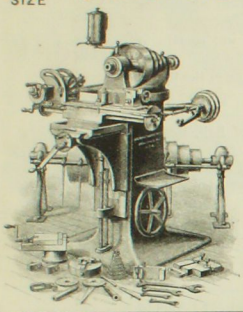
Factory, 330 to 342 E. 61st St.

SMALL SIZE UNIVERSAL MILLING MACHINE,

MADE BY

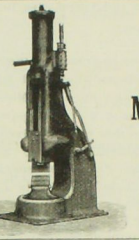
BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I., U. S. A.



This machine has all the movements of a plain Milling Machine, and, in addition, is fed automatically at an angle to the axis of Spindle, and has an adjustment to stop at any required point. The knee can be moved perpendicularly through a distance of 14 inches, and has a dial giving a reading in thousandths of inches. The Saddle, holding the Spiral Bed also, has a movement, parallel with axis of Main Spindle, of 6 inches, also indicated in thousandths of inches. On the Spiral Bed are placed a Head and Foot Stock, having centers upon which Reamers, Taps, Drills or Mills can be held for grooving, etc., either straight or spiral, right or left hand. The Head, holding one center, can be set at any angle between 5 degrees below a horizontal to a perpendicular position, and upon an Arbor inserted in the Spindle can be cut angular Mills, Cutters or Bevel-gears. The Head can also be placed at a right angle on the Bed, and operations performed upon the face of work held in a chuck which goes upon the end of Spindle. The Vise shown in cut has Jaws 5 inches wide, 1 inch deep, will open 2¾ inches, and can be clamped upon the Bed at any angle.

☞ Illustrated catalogue sent per mail on application.



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CHALLENCE COACH GREASE.

The Best Hot-Box Compound Made.

Guaranteed to run a car 5,000 miles with one greasing. Correspondence solicited. Will guarantee to furnish grease to give absolute satisfaction or no charge for same.

CHICAGO, February 9, 1883.

W. S. CALHOUN & Co., CHICAGO—

DEAR SIRS: The following is a report of test made with "Challenge Coach Grease," under passenger coach No. 69 up to date: Car made 8,200 miles the first greasing (one box hot); removed journal bearing; applied more grease to the seven other bearings, and continued the test until car had made 20,600 miles. Average reduction by friction, 8 oz. per bearing; average mileage to 1 oz. of reduction, 2,575 miles. Amount of grease used since being packed, 4 oz. to each box or two applications, or 8 oz. to each box in all during test.

Yours truly,

A. J. BIRD, Foreman Passenger Depot,
C., R. I. & P. Railway.

I certify that the above report is correct,
R. H. CHAMBERLAIN, Div. Supt. Illinois Div.

Approved:
B. K. VERBRYCK, M. C. B.,
C., R. I. & P. Railway.

GRAND RAPIDS, March 6, 1883.

W. S. CALHOUN & Co., CHICAGO—

DEAR SIRS: Referring to your "Challenge Coach Grease," for railway coaches, I have this to say: that, after a thorough trial, I find it far superior, in every respect, to any grease we have yet used. The journals of the coach that were packed with your grease on December 9 last, on examintion to-day look as well as when first filled. Said coach has run 180 miles every day since journals were filled, viz., Dec. 9. I am perfectly satisfied that the "Challenge Coach Grease" will do all that is claimed for it, and have recommended its use on all our coaches.

Respectfully yours,
THOS. SHARP, Car Examiner,
For Chicago & West Michigan Railroad.

PRICE, 45 CENTS FOR GALLON OF NO. 71-2, F. O. B. CHICAGO.

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RAILWAY TRAIN BRAKES.

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Especially Adapted for LOCOMOTIVE, CAR, ROLL-NECK and MACHINERY BEARINGS, and for Pump-Rods, Valves Plungers, etc., for Mine Use where sulphurous water and acids are found

LETTERS PATENT have not been taken out, so that any one using our goods runs no risk of being associated with any lawsuit. NO INTERFERENCE can be filed against the use of Ajax Metals on the contrary, letters of recommendation from the leading steel and iron mills, foundries and machine shops of this country are shown upon application. Also reports of tests as made by MASTER CAR-BUILDERS and MASTER MECHANICS, who are acknowledged AUTHORITY. Full information given on application to

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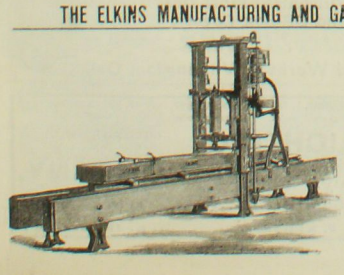

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DANIELS PLANING MACHINES A SPECIALTY.

MANUFACTORY: WORCESTER, MASS,

UNITED STATES OF AMERICA.

NATIONAL CAR BUILDER SUPPLEMENT

AND EXPORT EDITION.

At the request of prominent Railroad officials and others, we commenced two years ago the compilation of accurate lists of the American Manufacturers of Railroad Rolling Stock and Materials, published them in the form of a Supplement to the NATIONAL CAR BUILDER, and distributed it gratuitously to every official in the Purchasing and Mechanical Departments of every Railroad in the United States, Canada, Mexico, Central and South America, West Indies, Australia, New Zealand, and such other foreign countries as could buy Railroad Material in the United States with advantage. Although the undertaking involved an amount of labor and expense that was not anticipated, the outlay was fully warranted by the very flattering reception it received by Railroad men and the business community generally.

We are now preparing the THIRD ANNUAL SUPPLEMENT AND EXPORT EDITION, and it will contain as follows:

Complete lists of every Car and Locomotive Builder, Axle, Car Wheel, and Car Spring Manufacturer in the United States and Canada.

All the Rail Mills of the country.

Complete lists of the Street Railroads in the United States and Canada, their Gauge, Weight of Rail, Mileage, number of Cars and Horses, Officers' Names and Addresses.

The Railroads (both Steam and Street) in Mexico, Central and South America, the West Indies, Australia, New Zealand, with the Gauge, Weight of Rail, Mileage, number of Cars and Locomotives, Officers' Names and Addresses, &c.

This is the only publication that has ever given this information.

It will be distributed *gratuitously* to every person whose name appears in the paper, and in addition will be sent to every General Manager, Superintendent, Purchasing Agent, Chief Engineer, Master Mechanic, Master Car Builder, and Road Master of all Railroads in the United States and Canada.

The Supplement is the ONLY advertising medium which reaches Street Railroad Officers, and is the BEST and CHEAPEST means of reaching Railroad Officers in adjacent foreign countries.

It is the experience of the publishers, during the past two years, that Railroad men and others keep the "Supplement" on their desks or hung near at hand throughout the year for reference, not only for the lists, but for the advertisements, which form a conveniently indexed collection of trade circulars of nearly TWO HUNDRED of the best and most responsible manufacturers of railroad material, a collection not to be obtained in any other way.

As to its value as an advertising medium, we respectfully refer to a few of the prominent manufacturers who have used its pages, as follows:

Adams & Westlake Manufacturing Co., R. R. Supplies, Chicago, Ill.
Addy, Matthew & Co., Pig Iron, Cincinnati, Ohio.
Albro, The E. D., Co., Mahogany etc., Cincinnati, Ohio.
Allen Paper Car Wheel Co., Car Wheels, New York and Chicago.
Baldwin Locomotive Works, Philadelphia, Pa.
Baltimore Car Wheel Co., Car Wheels, Baltimore, Md.
Bickford, H., Upright Drills, Cincinnati, Ohio.
Bradley & Co., Power Hammers, Syracuse, N. Y.
Brill, J. G. & Co., Cars, Philadelphia, Pa.
Brownell & Wight Car Co., Street Cars, St. Louis, Mo.
Chilled Car Wheel Grinding Co., Chicago, Ill.
Cliff & Righter Co., Car Springs, Oswego, N. Y.
Congdon Brake Shoe Co., Chicago, Ill.
Curran & Wolff, Lumber Dryers, Chicago, Ill.
Detroit Car Spring Co., Detroit, Mich.
Devoe, F. W. & Co., Paints and Varnishes, New York, N. Y.
Fairbanks & Co., Scales, New York, N. Y.
Fay, J. A. & Co., Wood Working Machinery, Cincinnati, O.
French, A. & Co., Car Springs, Pittsburgh, Pa.
French Spiral Spring Co., Car Springs, Pittsburgh, Pa.
Globe Ventilator Co., Ventilators, etc., Troy, N. Y.
Goodell & Waters, Wood Working Machinery, Philadelphia, Pa.
Hancock Inspirator Co., Injectors, etc., Boston, Mass.
Harper, E. L. & Co., Pig Iron, Cincinnati, O.
Hathaway & Robison, Street Railway Contractors, Cleveland, O.
Hopkins, D. A., Journal Bearings, New York, N. Y.
Howard, James L. & Co., R. R. Supplies, Hartford, Conn.
Heimbacher Forge and Rolling Mill Co., St. Louis, Mo.
Iron Clad Paint Co., Metallic Paints, Cleveland, O.
Jones Car Manufacturing Co., Cars, Schenectady, N. Y.
Long & Co. (Vulcan Forge & Iron Works), Axles, etc., Pittsburgh, Pa.
Maher & Brayton, Car Wheels, Cleveland, Ohio.
Meeker, A. B. & Co., Pig Iron, Chicago, Ill.
Midvale Steel Co., Axles, etc., Philadelphia, Pa.
Nashua Iron & Steel Co., Axles, etc., Nashua, N. H.
Nathan & Dreyfus, Injectors, etc., New York, N. Y.
National Car Spring Co., Car Springs, New York, N. Y.
Northwestern Horse Nail Co., Horse Nails, Chicago, Ill.
Penfield Block Co., Tackle Blocks, Lockport, N. Y.
Porter, H. K. & Co., Locomotives, Pittsburgh, Pa.
Ramapo Wheel & Foundry Co., Car Wheels, Ramapo, N. Y.
Rogers, C. B. & Co., Wood Working Machinery, Norwich, Conn.
Stephenson, John. Co., Street Cars, New York, N. Y.
Sweet's Manufacturing Co., Toe Calks, etc., Syracuse, N. Y.
Union Brass Manufacturing Co., Car Trimmings, etc., Chicago, Ill.
Valentine & Co., Varnishes, New York, N. Y.
Westinghouse Air Brake Co., Pittsburgh, Pa.
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Flexible Vulcanized Fibre Dust Guard and Oil-Box Covers,
being absolutely unaffected by oil or heat, are far more durable and efficient than Leather, and much cheaper.
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Any specification
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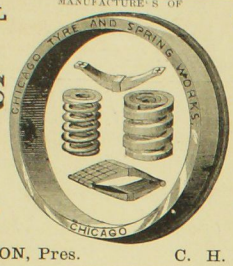

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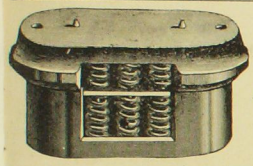

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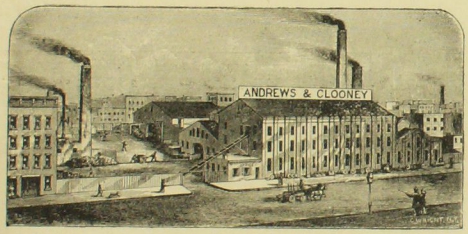

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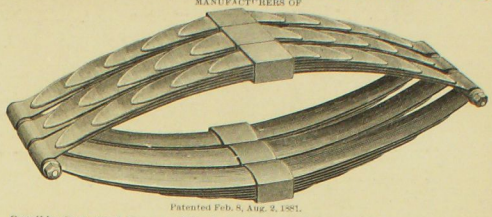

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Of the Best Grade of Cast Spring Steel.
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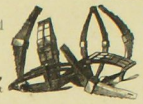

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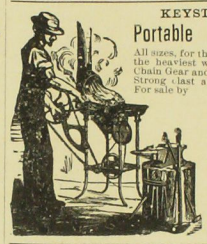

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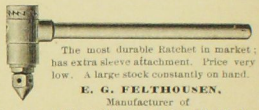

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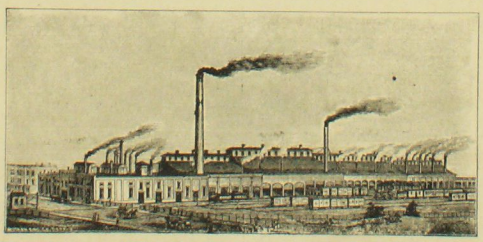

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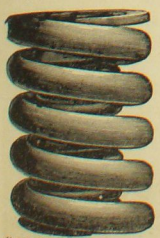

FROM BEST CAST STEEL.
DETROIT, MICH.
ALEX. DE LANO, President and Manager.
H. R. NEWBERRY, Secretary.

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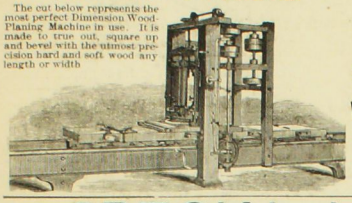

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EMERY WHEELS AND GRINDING MACHINES.

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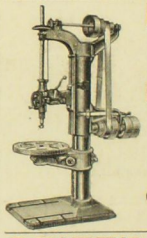

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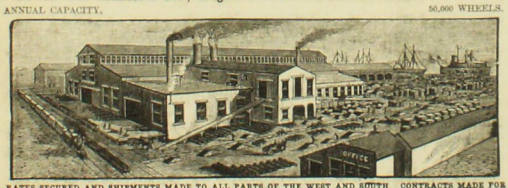

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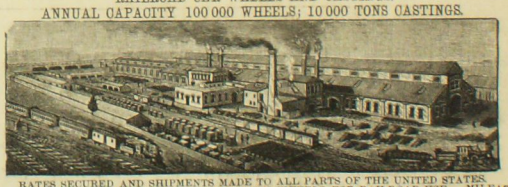

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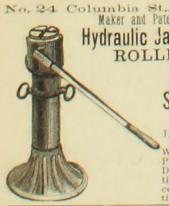

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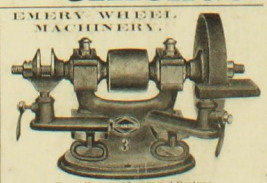

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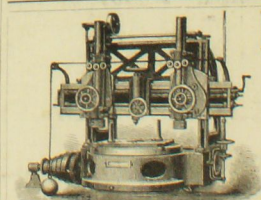

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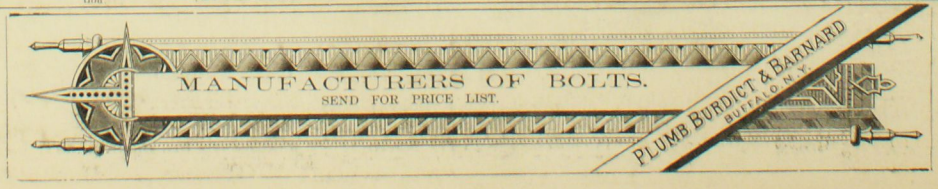
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